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The Canadian Economic and Fiscal Model
1996 Version

CEFM96

CEFM96 : PART 2

DYNAMIC FORECASTING AND SIMULATION PROPERTIES

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ABSTRACT

The Canadian Economic and Fiscal Model (CEFM) is used by the Department of Finance to forecast key economic and fiscal indicators as well as to simulate the economic and fiscal effects of policy or economic changes. This paper documents the dynamic forecasting and simulation properties of the 1996 version of this model, CEFM96. A detailed description of the theoretical structure and empirical specification of the model can be found in two companion papers.

The paper examines the ability of CEFM96 to forecast economic and fiscal data by performing a zero-add dynamic out-of-sample forecast over the 1990-1994 period. This allows us to evaluate the ability of the model to track an economic cycle that includes a major economic downturn as well as an unusually weak economic recovery. The results indicate that, in the very short run, the model correctly forecasts both the beginning and the length of the recession. The model predicts, however, a shallower recession and a much stronger recovery in 1992, but it tracks actual GDP growth in 1993 and 1994 rather well. A simple decomposition analysis indicates that most of the forecast error observed in 1991 and 1992 can be attributed to unexpected structural changes in import and investment functions. By contrast, the model reproduces quite precisely the inflation profile observed over the 1990-1994 period, as the underprediction of excess supply is compensated for by an underprediction of the extent of the depreciation of the Canadian dollar.

The paper also describes the responses of CEFM96 to simulated economic and policy shocks. The shocks discussed fall into three broad categories: (1) fiscal policy shocks, (2) monetary and financial market shocks, and (3) external and productivity shocks. The analysis shows that the model has sound dynamic properties in the short run as well as in the long run. The model is not converging to an explicit steady-state solution in response to permanent shocks, but it tends towards a new long-term equilibrium in a cyclical fashion. Overall, CEFM96 appears to be a valid and useful tool for forecasting as well as for economic and policy analysis.

RÉSUMÉ

Le Modèle Économique et Fiscal Canadien (MEFC) est utilisé par le Ministère des Finances pour prévoir des indicateurs économiques et fiscaux clés, ainsi que pour simuler l'impact économique et fiscal de changements économiques ou de politiques. Ce rapport documente les propriétés de prévision et de simulation dynamiques de la version 1996 de ce modèle, *MEFC* 96. Une description détaillée de la structure théorique et de la spécification empirique du modèle est présenté dans deux autres rapports.

Ce rapport examine, dans un premier temps, la capacité de MEFC96 à prévoir la conjoncture économique et fiscale à l'aide d'une prévision dynamique hors échantillon et sans intrants discrétionnaires au cours de la période 1990-1994. Cet exercice permet d'évaluer la capacité du modèle à reproduire un cycle économique qui inclut une récession majeure et une reprise économique particulièrement lente. Les résultats indiquent qu'à très court terme le modèle prédit bien le début et la longueur de la récession. Par la suite, le modèle prédit cependant une récession moins importante et une reprise économique plus vigoureuse, mais prédit assez précisément la croissance économique observée en 1993 et 1994. Une simple analyse de décomposition montre que la majeure partie de l'erreur de prévision en 1991 et 1992 résulte de changements structuraux imprévisibles dans les fonctions d'importation et d'investissement. Par ailleurs, le modèle reproduit assez précisément le profil d'inflation observé entre 1990 et 1994. Au cours de cette période, la sous prédiction de l'offre excédentaire est compensée par une sous prédiction de l'étendue de la dépréciation du dollar canadien.

Ce rapport décrit dans un deuxième temps l'impact dans MEFC96 de différentes simulations de chocs économiques et de politiques. Trois catégories de chocs sont présentés: (1) des chocs de politique fiscale; (2) des chocs monétaires et financiers; (3) des chocs externes et de productivité. L'analyse montre que le modèle a des propriétés dynamiques valables à court terme aussi bien qu'à long terme. Le modèle ne converge vers un état stable en réponse à un choc permanent, mais il tend vers un nouvel équilibre de long terme d'une façon cyclique. Globalement, MEFC96 se révèle être un outil valide et utile pour la prévision et l'analyse de politiques.

1 INTRODUCTION

The Canadian Economic and Fiscal Model (CEFM) is used by the Department of Finance to forecast key economic and fiscal indicators as well as to simulate the economic and fiscal effects of policy or economic changes. This paper documents the dynamic forecasting and simulation properties of the 1996 version of this model, CEFM96. A detailed description of the theoretical structure and of the empirical specification of the model can be found in the two companion papers.[1]

First, we examine the ability of CEFM96 to forecast economic and fiscal data by performing a dynamic out-of-sample forecast over the 1990-1994 period. This allows us to evaluate the ability of the model to track an economic cycle that includes a major economic downturn as well as an unusually weak economic recovery. Furthermore, this 5-year historical episode is long enough to provide an assessment of the medium- to long-term forecasting properties of the model.

In a second step, we describe the responses of CEFM96 to simulated economic and policy shocks. The shocks we discuss fall into three broad categories: (1) fiscal policy shocks (an increase in government expenditures, a personal income tax cut, a corporate income tax cut, a payroll contributions cut, and a reduction in the rate of the goods and services tax - GST); (2) monetary and financial market shocks (an increase in the money supply level, permanent and temporary increases in the short-term interest rate, and an appreciation in the Canadian dollar); and (3) external and productivity shocks (an increase in the world oil price, a reduction in U.S. activity, and an increase in the level of total factor productivity).

In these shocks, we simply assume that the objective of the monetary authority is to maintain the stock of money unchanged regardless of the origin of the shock. Under this non-accommodating monetary policy rule, we fix the money supply at its control level, and interest rates move to clear the money market.[2] The short-term interest rate is derived using an inverted M1 money-demand equation. With the nominal money supply fixed at control, the shock responses of the nominal short-term interest rate are therefore closely linked to the responses of nominal income. Although such a money supply rule is not the ideal characterization of the current monetary policy, which is based on inflation targeting, it has the advantage of clarity and simplicity. As a sensitivity analysis, we also compare the results obtained under that monetary rule to results obtained under the alternative assumption that the monetary authority follows a reaction function linked to the Consumer Price Index (CPI) inflation rate.

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[1] See Robidoux and Wong (1998) and Cao and Robidoux (1998) respectively.

[2] In contrast, in the forecasting exercise presented in Section 2 the short-term nominal interest rate is exogenous and the money supply is endogenous.

Except for the government expenditure shock, we fix real government expenditures on goods and services and capital formation at control levels in all shocks.[3] As a result, the shock responses of real final domestic demand reflect the responses of consumption and investment only. In addition, in all shocks, and especially in fiscal shocks, we assume that the fiscal implications are absorbed by an adjustment in the government budget balance position.[4] In other words, since tax rates are essentially exogenous to the model, any fiscal implication of the shocks will translate directly into a change in the deficit position.

Simulations start in 1988 and end in 2002, a total of 15 years. The results are presented for the first 5 years as well as for years 10 and 15. The short- to medium-term impact of these shocks are thus presented and discussed at a fairly detailed level. Even though the model does not have an explicit steady state, its equilibrium properties are sufficiently transparent to allow for a discussion of the expected long-run response to most permanent shocks. However, since the model tends to reach a new equilibrium in a cyclical fashion after a shock, the long-run response to a permanent shock is typically not achieved within the 15-year simulation horizon used.[5] Therefore, we use the response of the model over this horizon as well as the structure of the model, to discuss the long-term implications of the economic and policy shocks examined in this document. Notwithstanding these technical limitations, discussing the long-run impact of permanent shocks, even in an anticipated sense, contributes to a better understanding of the short- and medium-term effects of these shocks.

The rest of this paper is structured as follows. Section 2 documents the performance of the model in an out-of-sample dynamic forecast. Section 3 highlights the dynamic simulation properties of the model through a series of economic and policy shocks. The impact of using another monetary policy in these shocks is presented in Section 4. Section 5 gives the weights of the implicit monetary condition index and the sacrifice ratio embodied in the model. Section 6 provides concluding remarks.

2 THE FORECASTING PERFORMANCE

To assess the ability of CEFM96 to forecast, we perform a fully endogenous out-of-sample forecast over the 1990Q1-1994Q4 period. This five year period allows us to test the ability of the model to track key economic indicators over more or less the standard horizon used by most forecasters. In addition, this historical episode, which includes a recession and an unusually slow recovery, allows us to test the ability of the model to predict turning points that characterize economic cycles. In that dynamic forecasting exercise, all add-factors are set to zero and all exogenous variables are set at their historical values. The short-term interest rate, as

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[3] In contrast, in the forecasting exercise presented in Section 2 most nominal government expenditures are exogenous, leaving real government expenditures endogenous.

[4] Government balances are combined federal, PLH, and CPP/QPP balances, and are measured on a natioinal accounts basis.

[5] This is not unusual for a model that features such persistent dynamics.

measured by the 90-day commercial paper rate, is exogenous, but other interest rates and the exchange rate are endogenous. Nominal government expenditures are exogenous, but real government expenditures are endogenous because prices are endogenous. Since this is an out-of sample simulation, the estimation period ends in 1989Q4 for all stochastic equations.

The results of this out-of-sample dynamic simulation for real gross domestic product (GDP) and the GDP deflator are presented in Charts 1 and 2. More detailed results are presented in Chart 3. In the very short run, the model does well at forecasting the beginning and the length of the recession. In fact, the forecast recession leads the actual recession by one quarter. The model predicts a shallower recession, however, and a much stronger recovery in 1992, but it tracks the actual GDP growth in 1993 and 1994 rather well. As a result, the model predicts much less excess supply than the Canadian economy actually experienced in the early 1990s. The predicted GDP growth averages 1.8 per cent from 1990 to 1994, this is almost twice the actual growth rate of 1 per cent.

In contrast, the model reproduces quite precisely the price profile observed over the whole simulation period. Although the model overpredicts inflation by roughly 1 percentage point in 1990 and 1992, the predicted level for the inflation rate, as measured by the GDP price, is roughly right on average at 2.1 per cent. This result is surprising, since the model greatly overestimates the strength of the economy in 1991 and 1992. Under the output scenario that was actually observed over the 1991-1992 period, the model would have predicted less inflation or may be deflation in 1994. This is offset, however, by an under prediction of the extent of the depreciation of the Canadian dollar over the simulation period. As a result, under the actual output and exchange rate profile, the model would not have produced a very different inflation figure.

In the labour market, the overestimation of growth in the medium term translates into an under estimation of the unemployment rate. On the fiscal side, the model tracks the deficit of all governments very well up to 1991 but then starts to underestimate as the growth in nominal GDP overshoots. This suggests that the model can track government balances relatively well as long as the economic variables are correctly evaluated.

What accounts for the failure of the model to predict a deeper recession as well as a weaker recovery? The detailed results of the forecast in Chart 3 show that the model tracks consumption quite well up to the end of 1991, but overpredicts in 1992 and thereafter. The results show also that the model is not able to capture the downward shift that occurred in both residential investment and business structure investment in 1991 and 1992, respectively. It overestimates net exports in 1991 mainly because of an underprediction of imports. The model predicts a fall of 1 per cent in imports in 1991, whereas they actually increase by more than 3 per cent. The underprediction of imports is particularly surprising because the model overpredicts the final domestic demand. These results suggest a potential misspecification of import demand functions. A dynamic simulation of import demand functions in which all relative prices and activity variables are set to their historical values confirms this. Over the 1990 to 1994 period,

this out-of-sample simulation produces an underestimation for imports similar to the one in the forecast indicating that the problem is mainly located in imported end products.[6]

A pure decomposition analysis of the difference between simulated and actual data indicated that the underprediction of imports accounts for 1.2 percentage points of the forecast error in GDP growth in 1991, while residential and business structure investment accounts for 0.7 and 0.9 percentage points of the forecast errors in 1991 and 1992, respectively. Thus, accounting for structural breaks in the determination of imports and investment reduces the GDP growth forecast error to roughly 0.6 percentage point in both 1991 and 1992. This in turn reduces the average predicted growth rate over the whole 1990-1994 period to 1.3 per cent from 1.8 per cent.

In sum, this exercise suggests that the model reproduces the 1990-1994 economic episode fairly well, as long as two key structural changes in imports and investment are taken into account. Although the reasons behind investment changes are unclear to us, it would be easy to relate the structural break in import functions to major changes in trade policies implemented over that period. This would suggest that model users and particularly forecasters should bear in mind the Lucas critique when major policy changes occur.

Finally, we stress one point: although CEFM96 does not predict the magnitude of the recession, it is able to foresee the beginning of the recession in 1990 clearly. It is well known that forecasters, whether using macroeconometric models or not, have a poor record in predicting economic downturns. For example, a 1996 issue of *Business Week* noted that U.S. forecasters it surveyed missed four of the five recessions over the previous 25 years.[7] In Canada, Campbell and Murphy (1996) show that none of the nine private sector forecasters they surveyed were able to foresee the recession. In that context, we contend that CEFM96 performs relatively well and can be a useful tool in forecasting exercises.

3 DYNAMIC SIMULATION PROPERTIES

3.1 Fiscal Policy Shocks

This section presents the response of the model to five types of fiscal policy changes, including an increase in government expenditures and reductions in personal income tax, sales tax, payroll contributions, and corporate income tax. These expenditures and taxes are the main policy instruments available to governments in the model.

These fiscal policy shocks all have similar effects on the economy in the short run. Since potential output is not affected initially, the fiscal stimulus puts upward pressure on inflation.

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[6] See Stuart (1995) and Cao and Robidoux (1998) for more details

[7] See *Business Week*, "Especially Dismal at Downturns", September 30, 1996, 88-89.

Given the non-accommodating stance of monetary policy, inflation induces an upward pressure on interest rates and hence on the exchange rate.[8] These changes in relative prices contribute to slow down the progression in consumption and investment caused by the initial shock and to reduce net exports. Aside from the corporate tax shock, with time the positive effect on output disappears as the crowding out of domestic and external demand becomes large enough. At this point, the model's dynamics tend to push output below the control values for a while before returning to control, and so on.

Since the model reaches a new equilibrium in a cyclical fashion, the long-term implications of such shocks are not obvious. However, for all fiscal shocks but the corporate tax shock, the model tends to deliver higher real interest rates and a higher real exchange rate compared with the control.[9] On the one hand, this should reduce both consumption and net exports. On the other hand, investment is generally unchanged as a result of the reduced price of imported capital, which offsets the increased real interest rate. As a result, the level of potential output is likely to be largely unaffected by these shocks in the long term.[10] In contrast, the reduction in corporate taxes reduces the price of capital relative to the aggregate output price and therefore increases potential output through an increase in the desired capital output ratio.

Finally, all these shocks imply an increasingly higher government debt-to-GDP ratio. While we assume that the government is willing to let the deficit and the debt increase in the short run, the long-run choice will either be to reduce government expenditures or to raise taxes. In the model, this will ultimately push the real interest rate and the real exchange rate roughly back to their control values, leaving aggregate output around the same level. Indeed, the reduction in expenditures or the increase in taxes would have to be larger than the initial shock to pay for the interest on the incremental debt accumulated over the years. This means that the real interest rate and the real exchange rate will have to return to a lower level than the control to keep aggregate demand and potential output unchanged.

However, some factors are missing from the model structure suggesting that this analysis is probably underestimating the negative impact of such shocks on potential output. First, a higher government debt and a deterioration of Canada's trade balance are likely, at least in the short to medium run, to increase the country's foreign indebtedness significantly. Servicing of increased foreign debt in the new steady state would imply an increase in net exports, which could be obtained only through a permanent depreciation in the real exchange rate. The real depreciation means that capital, which is largely imported, is more costly to purchase, and as a result, the desired capital stock and potential output are somewhat lower in the long run than the

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[8] The main exchange rate in the model is the Canada-U.S. exchange rate, defined here as the unit of U.S. dollars per Canadian dollar. An upward movement in the exchange rate implies an appreciation of the Canadian dollar.

[9] With unchanged potential output, higher government expenditures or lower taxes have to displace private domestic activity. This happens through an increase in the real interest rate and the real exchange rate.

[10] This scenario depicts quite well the long-term implication of a change in government expenditures. In the case of a cut in personal, sales, and payroll taxes, the fall in consumption caused by higher real interest rates is more than compensated for by the increase in real disposable income. Thus, investment, and hence potential output, is more likely to be slightly reduced by such tax shocks.

control values. Second, a higher risk premium will likely be associated with the increase in government and foreign indebtedness. That would mean that the real interest rate facing governments and possibly private agents will not return to pre-shock levels, as suggested above, after a stabilization in the debt-to-GDP ratio at a higher level. Finally, it is assumed in the model that changes in the level of taxation do not distort the supply of labour, which is exogenous in the long run. Theory suggests, however, that raising income taxes reduces the supply of labour by distorting the labour-leisure choice made by households. Thus, as long as governments use income taxes to stabilize relative debt even just partly, they are likely to produce a negative impact on the level of potential output.

In sum, the long run effects that these fiscal shocks are likely to have on the real economy, given the structure of the model, amount to roughly ***nothing***. However, when we take into account the most obvious limitations discussed above that characterize CEFM96 in the context of these shocks, we expect the long-run economic impact to be somewhat ***negative***. For example, the simulation analysis performed by Macklem, Rose, and Tetlow (1994) suggests that increasing the debt-to-GDP ratio from 60 to 80 per cent may reduce potential output by 0.6 per cent when the above limitations are taken into account. Their results also suggest that the main economic cost of a higher relative government debt is to lower the sustainable level of consumption, since net exports must increase to cover additional interest payments on the increased foreign debt.

Having discussed the probable long-run effects of these shocks on the real economy, we now turn to a more detailed description of the short- to medium-run effects.

3.1.1 A Permanent Increase in Government Expenditures

In this simulation, we increase real non-wage federal government expenditures permanently above control levels by an amount equivalent to 1 per cent of control-level real GDP. These expenditures correspond to current spending on goods and services and thus do not include fixed capital formation. All other real government expenditures are held constant at their control values through a set of simulation rules. We do not expect the increase in government expenditures to be neutral with respect to the composition of the aggregate real demand. As noted above, however, we do expect the aggregate demand and supply to be largely unaffected by the shock in the long run.

As shown in Table 1, the effect on aggregate demand real GDP builds up gradually to peak at 0.96 per cent after four years. This upswing is reflected in all major components of aggregate demand except net exports, which are crowded out in the short run. Given the non-accommodating stance of monetary policy, any price-level implication of the shock has to be offset in the long run. As a result, nominal interest rates respond fairly quickly as excess demand puts pressure on the price level. After four years, short-term interest rates have risen by 37 basis points in nominal terms, 32 basis points in real terms, and this helps slow the progression in consumption and investment caused by increased income and output. Higher interest rates cause an appreciation of the Canadian dollar. The stronger dollar, together with higher domestic prices,

discourages exports but boosts imports. Consequently, net exports deteriorate and partly offset the increases in real domestic demand.

The negative contribution from net exports is enough to pull aggregate demand back towards the control values after four years. The role played by net exports is illustrated by the fact that the turning point in output precedes the turning points observed in consumption and investment. Aggregate output returns to the control level after nine years. Since the price level is still well above control at that point, it is clear that aggregate demand must considerably undershoot the control level to open a large enough output gap to bring the price *level* ultimately back to control. In fact, aggregate demand undershoots control values for another 9 to 10 years before reaching control again. After 10 years, the total government deficit has increased by $11 billion, and the ratio of government debt to GDP is 6.3 percentage points higher than in the control state.

3.1.2 A Permanent Reduction in Personal Income Taxes

In this simulation, we increase net federal income tax revenue permanently by an amount equivalent to 1 per cent of control-level GDP. The shock assumes that the federal tax change does not directly affect PLH income tax revenues. To ensure that this shock is directly comparable to the preceding government expenditure shock, we adjust the size of the shock by changes in the deflator for government expenditures during each period of the simulation. As a result, this simulation corresponds to a *real* government tax shock. The results are presented in Table 2.

The initial economic effect of the personal income tax cut is that real GDP increases by 0.06 per cent. This small impact at the beginning reflects the fact that consumers adjust only slowly to the valuation of their permanent income. With time, however, aggregate demand is stimulated, peaking in the fifth year at 1.5 per cent higher than control. The impact on aggregate demand is positive and widespread, except for net exports. The income tax cut boosts income and hence consumption throughout the simulation. Given the strict price stability objective of monetary policy, increased demand translates directly into higher nominal interest rates, which help to bring demand back towards the control values. As it was for the government spending shock, the crowding out of net exports is much more rapid than the crowding out of final domestic demand. In the case of investment, the positive output effect dominates the negative user cost effect arising from the higher interest rates, especially since the latter are partly offset by the dollar appreciation, which lowers the relative price of capital goods in the short run.

As noted above, the peak effect is observed in the fifth year, when output is 1.5 per cent higher. From there, it takes another five years before output returns to the control level. The total government deficit has by then increased by $9.1 billion, while the ratio of government debt to GDP has increased by 4.6 percentage points. After that, aggregate demand follows a pattern similar to that in the previous shock as it undershoots control values for a while.

3.1.3 A Permanent Reduction in the Goods and Services Tax Rate

In this shock, we decrease the GST rate permanently by 1 percentage point relative to control rates. The results are shown in Table 3. The reduction in taxes levied on consumption and residential investment has a direct positive effect on these components of domestic demand in the short to medium run. In addition, in contrast to previous fiscal shocks, the reduction in the GST rate stimulates economic activity through relative prices since it has a direct effect on domestic consumer prices. The cut in the GST rate puts downward pressures on prices and wages, allowing a fall in interest rates in the short term and hence a depreciation of the exchange rate. In addition to the direct impact of the tax cut on consumption, the induced effects on interest rates and the exchange rate stimulate aggregate demand.

As a result, real GDP increases 0.04 per cent in the first year, 0.4 per cent in the third year and 0.7 per cent in the fifth year. This upswing reflects increases in all major components of final demand in the very short run. However, after the first two years the change in net exports turns negative, as the increase in imports caused by increased domestic activity dominates the increase in exports caused by the depreciation of the real exchange rate. The impact on real GDP peaks in the fifth year because inflation pressures start to push interest rates and the exchange rate above the control levels. This tightening in monetary conditions puts downward pressure on aggregate demand, and output returns gradually to control, which is reached in about year 10. The total government deficit has then increased by $1.1 billion, while the ratio of government debt to GDP is only 0.2 percentage point over the control value. These small changes in government debt and deficit positions reflect the fact that this shock has a positive effect on total government balance in the medium term. This result is sensitive, however, to the assumption that the wage rate matches the initial fall in consumer prices caused by the cut in the GST rate.

3.1.4 A Permanent Reduction in Payroll Contributions

In this simulation, contributions of both employers and employees to the Canada and Quebec pension plans and the unemployment insurance fund are permanently reduced by 10 per cent. Aside from the Quebec Pension Plan, provincial payroll taxes are not changed in the shock. The contributions cut increases the net income available to households and hence stimulates consumption and residential investment. In addition, the shock reduces the costs of labour for firms and, as a result, increases labour demand and employment. This is offset in the medium run, however, by the fact that the market pre-tax wage rate reacts to the cut in payroll contributions.[11] In fact, other things being equal, the market pre-tax wage rate is assumed to offset any changes in payroll contributions paid by employers over a horizon of two years.[12]

Table 4 shows the results of the payroll contributions cut shock. The first-year initial impact of a cut in payroll contributions is to increase real GDP by only 0.03 per cent. With time,

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[11] Such a reaction is likely, if these contributions are viewed as benefits by employees. SeeDea and Robidoux (1995) and Archambault and Hostland (1996) for empirical evidence.

[12] This result holds true in a static simulation of the wage Phillips curve in CEFM96.

aggregate demand is stimulated and peaks in the sixth year at 0.4 per cent over the control level. As for the previous fiscal shocks, the impact on aggregate demand components is positive and widespread, except for net exports. The payroll contributions cut reduces labour costs for firms and increases labour income for workers. This tends to stimulate both employment and consumption. In the very short run, the fall in labour costs put also downward pressures on domestic prices as well, which allow for a fall in interest rates and a depreciation of the exchange rate. In the short to medium run, however, the reduction in the payroll contributions translates into a higher market wage rate that pushes back the domestic price towards its control level. The domestic price level is back to the control level in the fourth year and overshoots thereafter as the output effect peaks. This puts enough pressure on interest rates and the exchange rate to pull aggregate demand back towards the control level.

Aggregate output is back to the control level by the 10th year. At that point, the total government balance is reduced by $2.6 billion, and the government debt-to-GDP ratio has increased by 1.1 percentage points.

3.1.5 A Permanent Reduction in the Corporate Tax Rate

In this simulation, we lower the corporate income tax rate permanently below control levels by 10 percentage points. Although most of the action should come through investment, we expect this shock to have a short-run effect on the aggregate economy similar to the effect of the previous fiscal shocks. In contrast to those shocks, however, since this shock has a direct permanent effect on the user cost of capital, we expect potential output to be favourably affected in the long run. A lower tax on capital should increase the desired ratio of capital to labour as a result of a substitution from labour to capital. Given that labour is exogenous in the long run, this adjustment is made through higher capital and lower real wage. However, the substitution effect on real wage could be offset by the favourable potential output effect, and therefore it is not clear whether the real wage would rise or fall as a result of the shock. In any event, the capital stock will be higher and so will investment and potential output.

The results of the simulation of lower corporate taxes are shown in Table 5. This tax cut operates mainly by reducing the user cost of capital, which in turn raises investment and output. The growing profile of investment reflects the slow adjustment of the capital stock to changes in relative prices as well as the accelerationist effect associated with higher levels of output. Higher investment increases the stock of capital and hence potential output, but at a slower pace than the increase in actual output. The increase in output combined with a fixed money supply puts upward pressure on interest rates and the exchange rate, in both nominal and real terms. This moderates the increase in consumption caused by higher income and reduces net exports because of a fall in exports as well as a rise in imports. The excess demand generated by this tax cut in the short run also causes upward pressure on wages and prices. However, these pressures are offset by a fall in import prices that results from the appreciation of the dollar.

With time, potential output catches up and surpasses the increase in actual output, thereby opening an output gap. The excess supply puts downward pressure on prices, allowing aggregate demand and output to stay above control values without creating pressure on interest rates and

the exchange rate. As expected, therefore, in the long term a cut in the corporate income tax rate increases the level of potential output. After 10 years, potential output has increased 1.0 per cent, while the increase in real GDP is 0.6 per cent. The total government deficit has increased $7.7 billion, which means an increase of 5.8 percentage points in the government debt-to-GDP ratio.

3.1.6 A Comparison of Fiscal Multipliers

To compare the impact of these fiscal shocks, Table 6 shows the associated multipliers. For the first two years, the multiplier associated with government expenditures dominates the tax multipliers. After that initial period, tax multipliers are generally larger than the government expenditures multiplier. This is because the government expenditures shock is a direct shock to aggregate demand, while tax changes affect the aggregate demand indirectly through such channels as income and relative prices. Tax shocks take more time to influence the real side of the economy and they peak later. Tax multipliers peak in the fifth year, while the government expenditure shock effect peaks as early as the fourth year.

After five years, the cumulative multiplier is around 5 per cent for the GST and personal income tax shocks, around 4 per cent for the government expenditures' shock, and slightly over 3 per cent for the payroll contributions and corporate income tax shocks. The payroll contributions shock has less impact on aggregate demand because it is partly offset by an increase in the market wage rate, while investment reacts slowly to the fall in the real user cost of capital induced by the corporate income tax cut. In contrast, the cut in the GST rate puts downward pressure on prices and wages that reinforces the stimulus effect caused by the shock itself. The stronger impact associated with the personal income tax shock likely reflects the effect on consumption of an increase in interest income, induced by higher real interest rates. This effect mitigates the direct downward pressure on consumption emanating from increased real interest rates.

In any event, in the longer term most of these multipliers are virtually zero, as can be seen in Table 6. Cumulative multipliers are also converging to zero after 15 years since most multipliers exhibit a negative cycle after roughly a decade. As mentioned above, the notable exception is the corporate income tax shock, which depicts a positive multiplier over the longer-term horizon as a result of its favourable impact on the capital stock and potential output.

3.2 Monetary and Financial Market Shocks

3.2.1 A Permanent Increase in the Level of Money

In this simulation, we increase the level of M1 permanently by 1 per cent over control values. The main purpose of this shock is to evaluate the neutrality property of the model in the long run. Since the model is characterized by rigidities in the adjustment of the price level and inflation, we expect a permanent monetary shock to have important transitory effects on the real side of the model. However, in the long run we expect the change in money to be fully transmitted into a proportional change in the entire price structure, leaving all relative prices unchanged.

The effect of the change in money on the major components of aggregate demand is shown in Table 7. We see that the shock generates a long cycle of a mild amplitude with output and the broad components of aggregate demand rising above the control levels for about nine years and then undershooting the control for the subsequent six years. As expected, in the ninth year output is back to control and the money shock has been fully reflected in the aggregate price level, with small changes in the composition of aggregate demand.[13]

In the short run, the increase in money diffuses through the real side of the economy via a decline in real interest rates. With price level rigidities in the short run, the money market clears through a decline in nominal interest rates. The peak effect on the 90-day commercial paper rate is felt in the first year after the shock with a decline of 30 basis points. Given the delayed adjustment in inflation expectations, the decline in nominal rates is also felt in the long run, although the drop in the 10-year bond rate peaks at somewhat less than 10 basis points.

The decline in real interest rates has a positive effect on all components of investment, especially residential construction in the first year. As for consumption, the favourable impact arising from the steepening of the yield curve in the short run is mitigated by the negative income effect associated with the drop in interest receipts. With a peak effect of nearly 1.7 per cent reached after five years, business investment is significantly more volatile than total output, which peaks at 0.3 per cent after three to four years. Given the rise in domestic demand combined with the real depreciation of the dollar, the rise in real imports exceeds that of exports, and the contribution of the net real trade balance is thus negative during the first few years following the shock.

The first component of aggregate demand to peak in the initial part of the cycle is residential investment and consumption. For the first three years, the substitution effect associated with the steepening of the yield curve dominates the negative financial wealth effect because of a lower return on assets. However, after three years, the fact that wealth effect starts to dominate substitution effect, explains the turning point in the consumption cycle.

Given the rise in business investment, potential output rises marginally before falling back gradually towards the control levels. Since there has been no change in the long-run desired ratio of capital to labour as a result of the shock, and also since the amount of labour is exogenously determined in the long run, the capital stock and thereby potential output return to control levels in the long run. This is why total aggregate demand must return to control as well.

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[13] In a model characterized by the neutrality property, we do not expect any change in the composition of aggregate demand at the end of the cycle. As noted above, however, the model still has to cycle around the control solution before reaching the eventual new equilibrium.

3.2.2 Increases in Short-Term Interest Rates

In this section, we present, first, the impact of a permanent increase of 100 basis points in the short-term interest rate, namely the 90-day commercial paper rate. A one-year temporary shock is discussed below. In contrast to other simulations, the monetary aggregate M1 is endogenous in these simulations since we are shocking the short-term interest rate. Changing the 90-day commercial paper rate immediately changes all other interest rates in the model, though most rates change by less than 100 basis points. It should also be noted that a given increase in nominal interest rates induces an even larger increase in real rates because of the downward pressure it puts on prices.

The results of a permanent shock are shown in Table 8. First, as noted above, an increase of 100 basis points in nominal rates induces a larger and increasing change in real short-term rates. The real short-term rate increases by 106 basis points in the first year up to roughly 155 basis points in the fifth year. The real long-term interest rate increases also but to a lesser extent, since the increase in nominal short-term rates is only partly transmitted to nominal long-term rates.

In the short run, the increase in real interest rates has an increasingly negative effect on aggregate demand and output. Consumption falls by 0.2 per cent in the first year, 1.3 per cent in the third year, and 1.5 per cent in the fifth year.[14] The fall in consumption reflects the increase in long-term rates as well as the flattening of the yield curve. These factors more than offset the small increase in income caused by the higher rate of return on assets. Residential investment is falling for the same reason but in a more important way as a result of a larger sensitivity to real rates on balance. The fall in business investment reflects both, the increase in the real cost of capital, directly caused by higher real rates, and the fall in aggregate demand.

The increase in nominal interest rates causes an appreciation of the currency, which, in turn, depresses exports and stimulates imports. However, this negative effect on net exports is more than offset by falling domestic prices and output, which reduces the negative impact on exports from the nominal appreciation and puts downward pressure on imports. Imports thus falling more than exports, resulting in higher net exports, which ease the downward pressures on domestic demand. Finally, the decline in real GDP averages 0.1 per cent in the first year, 1.2 per cent in the third year, and 1.5 per cent in the fifth year.

In the long run, we end up with higher real interest rates and, as a result, a real appreciation of the Canadian currency. Since the user cost of capital is dominated by the real interest rate impact, the levels of investment, capital, and potential output are all reduced. The net effect of having a real appreciation and a lower level of potential output is also to reduce the level of net exports. However, consumption increases because higher interest income dominates other negative effects. In contrast to the twin deficits caused by the fiscal shocks discussed above, higher interest rates increase government deficits and indebtedness but have little effect

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[14] The trough is observed in the seventh year, where consumption is 1.9 per cent below the control value.

on relative foreign indebtedness. That is because the improvement in the current account at the beginning of the simulation more or less offsets the impact of the deterioration of the service account and of the current account at the end of the simulation.

We now turn to the one-year temporary shock in the 90-day commercial paper rate, for which results are presented in Table 9. This temporary shock affects the economy in the very short run in essentially the same way as it does for the permanent shock. Although the temporary interest rate shock reduces economic activity in the short to medium run less than does the permanent shock, it has a long-lasting impact on aggregate demand which peaks in the second year. In terms of components, the peak effect is also observed in the second year for consumption, residential investment, and net exports, but a year later for business investment. Indeed, for business investment in construction, the peak effect is observed as late as four years after the initial shock.

Aggregate demand returns to pre-shock levels after eight years. By then, real consumer expenditures are roughly at the control levels, business investment is still below control levels and net exports are still above them. This reflects the fact that the external channel is the main channel through which the aggregate economy is brought back to control. In the medium run this channel is reinforced as the real exchange rate starts to depreciate because of the lower price level induced by a tightening of monetary policy. It also reflects the fact that investment is adversely affected by an increase in the real cost of capital as well as by a decline in aggregate demand. As a consequence, a longer cycle characterizes investment.

3.2.3 A Permanent Appreciation in the Nominal Exchange Rate

This simulation corresponds to a permanent nominal 1 per cent appreciation of the Canadian dollar vis-à-vis the U.S. dollar. This is the only shock to an endogenous non-policy variable in the model. To implement the shock, we exogenized the exchange rate. Even though this is not meant to be a realistic characterization of what happens when turbulence in the financial market causes a change in the risk premium on the Canadian dollar, it remains a good illustration of the price implications of an appreciation.

We expect the permanent change in the nominal exchange rate to be perfectly offset by a decline in the domestic price level that will leave the real exchange rate unchanged in the long run. This is because domestic costs that determine domestic prices in the long run are homogeneous of degree one with respect to domestic prices and foreign prices adjusted for the exchange rate. As a result, domestic prices are homogeneous of degree one with respect to foreign prices and the exchange rate and, therefore, will move one for one with them in the long run.

As can be seen in Table 10, the effect of the shock is fairly mild and relatively short-lived compared with previous shocks. Since prices adjust with a lag, the immediate effect of the nominal appreciation is transmitted entirely into a real exchange rate appreciation, and therefore net exports are reduced in the short to medium run. The negative impact on activity brought about by lower net exports contributes to lower investment. In contrast, consumption rises in the short run as downward pressures emanating from higher real interest rates are more than offset

by the steepening of the yield curve and the increase in real income brought about by lower prices.

The permanent reduction in the domestic price level induces a permanent fall in nominal interest rates to balance the demand for money. As domestic prices decline to the new equilibrium and inflation stabilizes, the real interest rate falls below control values. This induces a higher level of consumption and pushes investment back up to control levels and beyond. In parallel, the real-exchange rates and hence the level of exports are pushed back to control levels. As a result, aggregate demand and output return to control levels in the fifth year and stay there for another five years. Aggregate output then rises gradually and permanently over control values as a result of lower real interest rates.

3.3 External and Technology Shocks

3.3.1 A Permanent Decline in U.S. Real Activity

In this simulation, we reduce U.S. real GDP permanently by 1 per cent. Since all other U.S. variables are kept at control levels, the shock results represent only the partial effect of a weakening in U.S. economic activity and should therefore be interpreted with care. The easiest way to visualize this shock is as a change in the foreign level of potential output that leaves the U.S. real exchange rate unchanged.

As can be seen from Table 11, all the major components of aggregate demand decline gradually, led by net exports. However, after four years net exports rose above control levels whereas the other components remain below control. Since aggregate demand falls more rapidly than potential output, which adjusts as capital decumulates, an excess supply gap is opened in the short to medium run and this puts downward pressure on domestic prices. The fall in the level of both prices and output allows for lower nominal and real interest rates and hence a depreciation of domestic currency. The nominal depreciation combined with lower domestic prices translates into a substantial real depreciation of the dollar. These conditions tend to offset the negative impact of lower foreign activity on domestic demand and net exports. As a result aggregate demand and output are back to control levels after eight or nine years.

However, at that point the price level is still below the control level. As a result, real interest rates and the real exchange rate still stimulate aggregate demand. This results in a six-year cycle in which an excess demand gap is opened and domestic prices are pushed back to control levels. In the new (cyclical) equilibrium, aggregate demand is roughly unchanged but its composition is modified, with less net exports and more final domestic demand. The new composition is supported by a real depreciation of Canadian currency and a fall in real interest rates. The fall in real interest rates offsets the impact of the real exchange rate depreciation, leaving investment and hence potential output more or less unaffected.

However, the main adverse effect of this shock is to cause the current account balance to fall and to create a growing external debt through the accumulation of trade deficits. As a result, a higher level of net exports is likely to be needed to stabilize and service the extra debt. This

implies a more pronounced real depreciation of the exchange rate, a higher cost of capital, and a lower capital stock. It is thus likely that potential output will be slightly lower as a result of such a permanent negative foreign activity shock.

3.3.2 A Permanent Increase in the World Oil Price

In this shock, the world price of oil is permanently increased 20 per cent. We should interpret this shock with caution, as we do the U.S. activity shocks, since aggregate production and prices are held exogenous in foreign markets. Since the prices of commodities are assumed to be determined in world markets in CEFM96, this shock initially has a one-for-one impact on the price of oil in the domestic market. This directly affects the domestic cost of oil and its price structure, since natural resources are one of the three production factors in the production function. The shock also has a large impact on the prices of imported and exported commodities.

The effect of this price shock on the main economic indicators is presented in Table 12. The direct impact of an increase in the world oil price is an increase in domestic prices as well as export and import deflators. With a fixed money supply, higher domestic prices translate into higher nominal interest rates, and an appreciation of the domestic currency therefore follows. This does not, however, translate into higher real interest rates, because inflation is increasing at an even faster pace in the short run. Despite the reduction in real rates, all components of aggregate demand are pulled down during the first few years following the shock. The fall in the aggregate demand is driven by the drop in net exports which are directly affected by the shock, and to a smaller extent, by the negative impact exerted by the flattening yield curve on consumption.

The export deflator rises 1.1 per cent above control in the first year and 1.4 per cent in the following years. Although other export prices are slightly affected by the increase in aggregate domestic price, this increase mainly reflects an increase in the price of exported commodities. Higher export prices in combination with the appreciation of Canada's currency cause the relative prices of exports in foreign markets to rise and hence they reduce exports. Import prices increase also, though less than export prices.[15] Higher import prices raise the relative imported-to-domestic price faced by domestic importers. This, together with a weaker economic activity, results in a reduction of Canada's imports. The fall in exports is larger than the fall in imports. Therefore, net exports are reduced in the first two years. After that, however, the negative impact on net exports is reversed, as domestic activity declines even more. Even in the first two years, the gains in terms of trade more than offset the losses in net exports, and the current account improves.

The fall in the real user cost of capital, caused by the appreciation of the real exchange rate in the short to medium term, pushes back business investment in M&E towards control

[15] The price rise reflects only an increase in the price of the imported commodities, since the prices of other imported goods and services decline because of the appreciation of Canada's currency. Although its exports and imports of oil are roughly equal, Canada is clearly a net exporter of energy products. The terms of trade gain observed in the simulation reflects that of reality, sincespillovers to the price of other energy products such as natural gas and electricity are taken into account in determining the price of exported and imported commodities.

levels after five years. At the same time, consumption is also pushed back towards control because of a higher return on financial assets and a reduced spread between short- and long-term interest rates. In the long term, aggregate demand returns to control levels but the GDP deflator stays 0.3 per cent above control. Real money demand is balanced through an increase in nominal interest rates. This new equilibrium is thus characterized by a small increase in real rates and an appreciation of the real exchange rate. The unchanged aggregate demand reflects a reduction in net exports and an increase in domestic demand, with the latter reflecting a higher level of income.

In contrast to the U.S. activity shock, the main long-term impact of the world oil price shock is to improve the current account and to reduce foreign indebtedness through the accumulation of larger trade surpluses. Thus lower level of net exports is likely to be needed to stabilize the external debt, which in turn implies a real appreciation of the dollar, a lower cost of capital, a higher stock of capital, and a higher level of potential output. On average, the government balance is unaffected in the short to medium run but increases thereafter as the effect from higher levels of nominal GDP dominate the effect of higher interest rates.

How will this analysis change if the higher world price of oil comes about because of a reduction in the world supply of oil or a temporary increase in the world aggregate demand? The assumption that the shock originates from the supply side means that foreign countries would experience similar price and output effects as those observed in Canada. Since higher foreign prices and lower foreign output have opposite effects on our net exports and output, the above analysis is likely to be qualitatively unchanged. The long-term supply should be similar as well, since the deterioration of the foreign indebtedness of our major trade partners mirrors our improvement. If the increase in the price of oil were caused by a boom in world aggregate demand, it is likely that both domestic output and interest rates would increase more in the short to medium term.

3.3.3 A Permanent Increase in Total Factor Productivity

In this simulation, the level of total factor productivity (TFP) in the commercial sector is increased permanently by 1 per cent. The results are shown in Table 13. The immediate effect of a higher TFP is felt on the supply side where potential output is increased and domestic costs are reduced. The fall in domestic costs and the emerging excess supply gap translate rapidly into a lower domestic price level. With a given money supply, the reduction in the price level induces a fall in nominal interest rates and hence a depreciation of the exchange rate to keep the money demand balanced.

However, given the faster decline in the price level in the short run, the real interest rate rises during the first few years before falling gradually. As a result, both consumption and investment fall below the control levels at impact despite the rise in total aggregate demand. The decline in investment persists longer than the fall in consumption because investment is also affected by an increase in the price of imports. In addition, the initial fall in consumption is mitigated by the increase in the gap between short and long-term interest rates. The rise in net exports is enough to offset the decline in domestic demand, however, and generates an increase

in total aggregate demand. On the one hand, the combination of lower prices and a weaker dollar lowers the relative price of Canada's exports in foreign markets and raises export levels. On the other hand, the net effect of the sharp increase in the relative price of imports and the increase in final demand is that import levels are unchanged in the first year and decline in the following two years. The short-run overshooting of imports with respect to final demand explains the profile in imports.

As the temporary negative effect of relative import prices and real interest rates unwinds, all components of aggregate demand eventually increase above the control levels. Indeed, the output gap closes as early as three to four years after the initial shock. At that point, the economy has not yet reached its new equilibrium, since business investment is still below control. In effect, as well as directly enhancing productivity on potential output, this shock should raise the long-run demands for factors if relative prices are unchanged. With the amount of labour fixed in the long run, the adjustment should take place via an increase in the capital stock, and therefore we expect a permanent rise in the level of gross investment.[16] Also, given the fixed amount of labour, the rise in the capital stock should be accompanied by a permanent increase in the real wage. This implies that potential output should increase by a bit more than the initial increase in productivity. Although it takes time to build the larger desired stock of capital, we see that after 15 years the model is converging towards the new equilibrium. At that point, the potential output in the commercial sector and business investment, have increased 1.1 per cent over control, the real wage has also increased substantially.

4 SENSITIVITY ANALYSIS: AN ALTERNATIVE MONTARY POLICY

In the shocks presented above, we assume that the objective of monetary authority is to maintain the stock of money unchanged. For inflationary shocks, this monetary policy rule implies substantial increases in both nominal and real interest rates. As noted above, although such a strict money rule may not be the best approximation of what the Bank of Canada really does, it has the advantage of being clear and simple. In a sensitivity analysis, however, we compare the results obtained under that monetary rule with those obtained under an alternative monetary policy. More precisely, we assume that the monetary authority uses the following reaction function: $r = r_c + 0.5(\pi - \pi_c)$, where r and r_c are the 90-day commercial paper rates in simulation and control data sets, respectively, and π and π_c are the annualized quarter-over-quarter CPI inflation rates in simulation and control data sets, respectively.[17]

This alternative monetary policy is used for two fiscal shocks, namely the increase in government expenditures and the reduction in personal income taxes. The results are presented in

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[16] The increase in the capital-to-labour ratio is likely to be tempered by an increase in the relative price of capital caused by changes in the exchange rate. As a result, the capital-to-output ratio is likely to be reduced in the long term. In CEFM96, this effect is small because the effect of lower domestic prices dominates that of lower interest rates and therefore the exchange rate appreciates.

[17] Other experiments performed with larger coefficients than 0.5 show that simulation results are not too sensitive to the value of the adjustment coefficient.

Tables 14 and 15. As noted above, keeping the money supply at control levels as in our base monetary policy rule implies an increase in both nominal and real interest rates (Tables 1 and 2). In contrast, the alternative monetary policy accommodates more inflation pressures, as illustrated by smaller increases in nominal interest rates. As a result, the increase in inflation is larger than the increase in nominal interest rates, and real interest rates are falling. Under this alternative monetary policy, these fiscal shocks therefore create more inflationary pressures and produce a slightly longer upward cycle in output that peaks later and at a higher level.

For both shocks, real GDP is back to control values after roughly 10 to 11 years. At that point, however, the inflation rate is still above control values, and aggregate demand must therefore undershoot the control by a lot to open a large enough excess supply gap to bring inflation back to control. In the long term, aggregate demand returns to control, while price and money levels are permanently above pre-shock values. Thus, this alternative monetary policy does not greatly modify the long-run impact of such fiscal shocks, but results in higher multiplier effects in the short to medium term.

5 OTHER CHARACTERISTICS OF THE MODEL

5.1 Implicit MCI Weights

The sensitivity of the real economy to the real interest rate and the real exchange rate is a key characteristic of any open economy macro model. It defines the relative strength of the two main channels by which monetary policy can affect the real side of the economy and hence inflation. Although shocks to these real prices are not straightforward in CEFM96 because they reflect the movements in fundamental endogenous variables (nominal rates and prices), they reveal a lot about the functioning of the model in simulation mode.

Chart 4 shows the effects on real GDP of an increase of 100 basis points in the real short-term interest rate, holding the real exchange rate at control, and of a 1 per cent appreciation in the real exchange rate, holding all real interest rates at control. The increase in the real short-term interest rate has a relatively small impact in the first year but reduces real GDP by 0.50, 0.76, and 0.84 per cent, respectively, in the three following years. An appreciation in the real exchange rate has a tiny effect in the first year but then reduces real output by 0.17, 0.32, and 0.40 per cent, respectively, in the three following years. As Freedman (1994) suggests, changes in the real interest rate and the real exchange rate can be combined to construct an index of monetary conditions. This index (the MCI) corresponds to a weighted average of the changes in the real interest rate and the real exchange rate, where weights reflect their relative effects on real aggregate demand. According to the structure of CEFM96, the ratio of the weight associated with the real interest rate to the weight associated with the real exchange rate falls from 10 in the first year,[18] to 2.9 in the second year, then declining steadily thereafter, to 1.6 in the fifth year.[19]

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[18] The large ratio in the first year reflects the low impact of the real exchange rate on output.

This ratio is similar in magnitude to the ratio obtained in studies using a reduced-form output equation. For example, Duguay (1994) estimates long-term ratios of 3.9 and 2.4 over the periods 1975-1990 and 1980-1990, respectively,[20] with his preferred specification.[21] For the equation estimated over the 1980-1990 period, this reflects a negative impact of -0.67 per cent of the real interest rate and -0.28 per cent of the real exchange rate.[22] It is interesting to note that, in Duguay (1994), the real exchange rate effect does not originate from net exports but mostly from business investment.[23] In contrast, in CEFM96 most of the effect comes from net exports, the impact on business investment being positive in the first three years, before turning negative. This is because the appreciation of the real exchange rate, by itself, reduces the relative user cost of capital, since a large proportion of capital is imported. The positive effect on investment is only dominated by the negative output effect after the third year.[24]

As Duguay (1994) rightly notes, large-scale macroeconometric models typically have difficulty finding strong interest rate effects, but no trouble identifying exchange rate effects. He also suggests that the exchange rate effects are easily captured in these models because identifying restrictions are often imposed in estimating trade equations. The sensitivity of trade to the real exchange rate is then more or less imposed rather than estimated freely. Taking that into consideration, we are quite satisfied by CEFM96 in this respect, for two reasons. First, the model is more sensitive to the real interest rate than is typically the case in similar models. This results mostly from the impact of the yield curve on real consumer spending. Second, the strong sensitivity of the model to the real exchange rate does not mainly reflect constraints imposed on trade equations.[25]

5.2 Sacrifice Ratio

This section focuses on the transitory output costs of reducing the inflation rate. A summary measure that is often used to evaluate these costs is the sacrifice ratio, which is defined as the per cent output loss per percentage point reduction in inflation. The more appropriate

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[19] The average ratio over six to eight quarters is 2.8. This is similar to the ratio of 3 used in Freedman (1994).

[20] The long-term impact is reached after 8 quarters for the real interest rate and 12 quarters for the real exchange rate.

[21] Lavoie (1993) also gets a ratio of 3 but with a different specification.

[22] For the equation estimated over the 1975-1990 period, the elasticities are -0.77 and -0.20.

[23] We obtain the source of the response of aggregate demand by regressing the various components of GDP on the same explanatory variables as in his aggregate equation. More details are shown in Duguay (1992), where the real exchange rate coefficient has the wrong sign for imports and is roughly zero for exports.

[24] It is worthwhile stressing that the exchange rate weight in the MCI depends heavily on the short-run sensitivity of investment to changes in relative prices.

[25] Real import and export functions are estimated freely. However, some constraints are imposed on export prices, and the standard hypothesis of full pass-through of the exchange rate on import prices is assumed in the long run.

manner to calculate the sacrifice ratio in CEFM96 is to reduce money growth by 1 percentage point. Since money is neutral in the model, and money demand is homogeneous of degree one with respect to prices, a permanent decline of 1 percentage point in money growth should lead to a 1 percentage point decline in the inflation rate.

Although we are referring here to a one-time permanent shock to money growth, it corresponds to an ongoing permanent shock to the money level. This causes some technical problems in a model such as CEFM96. To understand this problem we have to note that the price level must be reduced not only to match the decline in money but also to accommodate the fall in nominal interest rates. To keep the real interest rate unchanged, the nominal interest rate has to fall by 100 basis points; the corresponding increase in real money demand must be accommodated by an additional fall in prices. The inflation rate thus must fall by more than 1 percentage point at some point in order to re-equilibrate the money demand. This is not possible in the model, since the determination of prices and wages is purely backward looking.

As a result, the sacrifice ratio can be approximated in CEFM96 only by cumulating the output gap losses up to the point where the inflation rate is effectively reduced by 1 percentage point.[26] As Chart 5 shows, this is obtained after roughly 10 years in the model, with a sacrifice ratio of 6.[27] The estimation appears to be in the upper range of the estimates obtained in other studies. This is not surprising since price and wage expectations are assumed to be purely backward looking in the model. As shown by Chadha, Masson, and Meredith (1992), and Laxton, Rose, and Tetlow (1993), the sacrifice ratio falls, among other things, with the degree of forward-looking behaviour in the price and wage settings. In fact, the estimate obtained from the model corresponds roughly to the estimate obtained by Laxton et al. (1993), when price and wage expectations are assumed to be purely backward looking. The estimate based on the model is also similar to the simple sacrifice ratio observed in the last recession as calculated by cumulative output losses divided by the change in inflation since 1991.

6 CONCLUDING REMARKS

In the first part of the paper we have looked at the forecasting ability of CEFM96 by performing a dynamic out-of-sample simulation over the 1990-94 period. The results indicate that the model reproduces fairly well this historical episode as long as structural changes in imports and investment behaviour are taken into account. This shows that the model can be used for forecasting as well as for detecting ongoing major structural changes in the economy.

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[26] At that point, it is assumed that economic agents are fully adjusting their inflation expectations, and that the nominal interest rate is reduced instantaneously to keep the real interest rate, and hence the output, unchanged. A period of adjustment to this new equilibrium would mean a larger sacrifice ratio.

[27] This disinflationary policy has an effect on the level of potential output that is not accounted for in this calculation. Accounting for this effect raises the sacrifice ratio to 9.6.

In the second part, we have presented and analysed the responses of CEFM96 to various economic and policy shocks. The analysis shows that the model has sound dynamic properties in the short run as well as in the long run. The model is not converging to an explicit steady state solution in responses to permanent shocks, but it tends towards a new long-term equilibrium in a cyclical fashion. Overall, CEFM96 appears to be a valid and useful tool for forecasting as well as for economic and policy analysis.

Table 1

Increase In Government Expenditures Equivalent To 1 Per Cent Of Real GDP

(percentage change from control unless otherwise specified)

Year	1	2	3	4	5	10	15
Real output and expenditures							
Potential output	-0.01	0.01	0.08	0.17	0.27	0.35	-0.12
Real GDP	0.45	0.76	0.93	0.96	0.93	-0.23	-0.50
Consumption	0.03	0.12	0.32	0.57	0.79	-0.21	-0.73
Residential investment	0.28	0.97	1.77	2.16	2.34	-1.41	-1.37
Business investment	0.51	1.86	2.94	3.49	3.46	-0.73	-3.71
Structure	0.50	1.66	2.77	3.52	3.83	0.96	-3.45
Machinery and equipment	0.51	1.99	3.05	3.46	3.26	-1.37	-3.80
Government expenditures	4.63	4.54	4.37	4.17	4.16	4.86	5.10
Exports	-0.06	-0.21	-0.41	-0.62	-0.80	-1.48	-0.70
Imports	1.69	2.01	2.36	2.64	2.61	0.60	0.10
Net exports to GDP (level)	-0.51	-0.64	-0.83	-1.01	-1.12	-0.90	-0.37
Prices							
Commercial wage rate	0.03	0.12	0.29	0.47	0.67	2.03	1.44
User cost of capital	0.38	1.04	1.57	2.08	2.40	1.20	2.16
GDP deflator	0.00	0.08	0.22	0.35	0.52	1.57	1.17
Consumer price index	0.01	0.03	0.08	0.12	0.23	1.42	1.29
CPI inflation rate (level)	0.01	0.02	0.05	0.04	0.11	0.20	-0.16
Short-term interest rate (level)	0.12	0.23	0.32	0.37	0.41	0.43	0.23
Long-term interest rate (level)	0.03	0.07	0.11	0.14	0.15	0.17	0.09
Real long-term interest rate (level)	0.03	0.06	0.07	0.09	0.08	-0.05	0.23
Exchange rate (US cents, + is app.)	0.05	0.17	0.32	0.46	0.51	0.37	-0.17
Real exchange rate (+ is app.)	0.06	0.28	0.59	0.88	1.14	2.07	0.94
Terms of trade	0.04	0.14	0.26	0.36	0.43	0.76	0.35
Miscellaneous							
Employment	0.17	0.44	0.61	0.62	0.56	-0.30	-0.44
Unemployment rate (level)	-0.12	-0.28	-0.37	-0.37	-0.34	0.21	0.23
Government balance ($b)*	-4.87	-4.55	-4.51	-4.94	-5.26	-10.96	-15.18
Government debt to GDP (level)	0.33	0.84	1.31	1.85	2.35	6.25	12.53
Current account ($b)	-2.84	-3.89	-5.14	-6.15	-7.20	-9.14	-8.02
Trade balance ($b)	-2.67	-3.42	-4.26	-4.92	-5.50	-4.23	-1.76
Investment income balance ($b)	-0.17	-0.46	-0.87	-1.24	-1.70	-4.92	-6.26
Foreign debt to GDP (level)	0.12	0.50	1.04	1.77	2.59	7.60	10.53
Adjusted disposable income	0.04	0.25	0.56	0.85	1.08	0.05	0.08
Savings rate	0.16	0.34	0.42	0.37	0.27	0.61	0.66

* Government balances are combined federal, PLH, and CPP/QPP balances, and are measured on a national accounts basis.

Table 2

Reduction In Personal Income Taxes Equivalent To 1 Per Cent Of Real GDP

(percentage change from control unless otherwise specified)

Year	1	2	3	4	5	10	15
Real output and expenditures							
Potential output	0.01	0.07	0.15	0.25	0.37	0.65	0.07
Real GDP	0.06	0.41	0.90	1.30	1.52	0.03	-0.63
Consumption	0.17	0.98	1.94	2.73	3.20	1.88	0.68
Residential investment	0.30	2.44	4.29	5.69	6.41	1.14	0.02
Business investment	0.02	0.44	1.57	2.92	3.94	-0.14	-5.20
Structure	0.02	0.42	1.44	2.73	3.86	1.80	-4.76
Machinery and equipment	0.02	0.46	1.66	3.05	3.99	-0.87	-5.35
Government expenditures	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Exports	0.00	-0.05	-0.17	-0.38	-0.63	-1.75	-0.71
Imports	0.17	1.10	2.18	3.05	3.43	0.73	-0.48
Net exports to GDP (level)	-0.05	-0.34	-0.70	-1.06	-1.33	-1.07	-0.11
Prices							
Commercial wage rate	0.00	-0.01	0.00	0.11	0.27	2.08	1.41
User cost of capital	0.03	0.41	1.16	2.24	3.17	1.24	1.75
GDP deflator	0.00	-0.01	0.00	0.08	0.22	1.62	1.19
Consumer price index	-0.01	-0.05	-0.10	-0.15	-0.11	1.32	1.30
CPI inflation rate (level)	-0.01	-0.04	-0.05	-0.05	0.04	0.30	-0.22
Short-term interest rate (level)	0.01	0.10	0.24	0.37	0.48	0.52	0.21
Long-term interest rate (level)	0.00	0.03	0.08	0.13	0.17	0.21	0.09
Real long-term interest rate (level)	0.01	0.06	0.14	0.16	0.18	-0.11	0.27
Exchange rate (US cents, + is app.)	0.00	0.05	0.17	0.37	0.53	0.61	-0.14
Real exchange rate (+ is app.)	0.00	0.05	0.20	0.51	0.86	2.47	1.00
Terms of trade	0.00	0.03	0.11	0.24	0.37	0.90	0.34
Miscellaneous							
Employment	0.01	0.14	0.41	0.66	0.82	-0.26	-0.72
Unemployment rate (level)	-0.01	-0.10	-0.27	-0.43	-0.52	0.20	0.39
Government balance ($b)*	-6.13	-5.91	-4.96	-3.92	-3.11	-9.06	-15.15
Government debt to GDP (level)	0.60	1.35	1.87	2.19	2.29	4.61	11.13
Current account ($b)	-0.28	-1.99	-4.24	-6.27	-8.17	-10.27	-6.02
Trade balance ($b)	-0.27	-1.86	-3.81	-5.45	-6.82	-5.12	0.31
Investment income balance ($b)	-0.01	-0.13	-0.43	-0.82	-1.35	-5.15	-6.33
Foreign debt to GDP (level)	0.00	0.07	0.38	0.96	1.79	7.77	10.53
Adjusted disposable income	0.49	1.60	2.42	2.94	3.12	1.63	1.36
Savings rate	1.26	0.67	0.09	-0.28	-0.33	0.25	0.57

* Government balances are combined federal, PLH, and CPP/QPP balances, and are measured on a national accounts basis.

Table 3

1 Percentage Point Reduction In The Goods And Services Tax Rate

(percentage change from control unless otherwise specified)

Year	1	2	3	4	5	10
Real output and expenditures						
Potentila output	0.00	0.01	0.03	0.06	0.10	0.26
Real GDP	0.04	0.19	0.42	0.63	0.70	0.12
Consumption	0.03	0.28	0.70	0.99	1.15	0.52
Residential investment	-0.03	0.35	1.17	2.33	2.54	0.33
Business investment	0.03	0.11	0.43	0.99	1.64	0.70
Structure	0.03	0.15	0.44	0.94	1.62	2.00
Machinery and equipment	0.02	0.08	0.43	1.02	1.65	0.25
Government expenditrues	0.00	0.00	0.00	0.00	0.00	0.00
Exports	0.11	0.26	0.28	0.23	0.11	-0.46
Imports	0.05	0.24	0.58	0.86	1.00	0.20
Net exports to GDP (level)	0.02	0.01	-0.11	-0.24	-0.37	-0.30
Prices						
Commercial wage rate	-0.30	-0.60	-0.68	-0.68	-0.61	0.30
User cost of capital	0.06	0.85	1.41	1.35	0.75	-0.45
GDP deflator	-0.50	-0.71	-0.79	-0.80	-0.74	-0.07
Consumer price index	-0.49	-0.66	-0.78	-0.86	-0.87	-0.23
CPI inflation rate (level)	-0.51	-0.17	-0.13	-0.08	-0.01	0.16
Short-term interest rate (level)	-0.15	-0.18	-0.14	-0.09	-0.05	0.01
Long-term interest rate (level)	-0.04	-0.07	-0.06	-0.04	-0.02	0.01
Real long-term interest rate (level)	0.27	0.26	0.08	0.06	0.02	-0.16
Exchange rate (US cents)	-0.04	-0.06	-0.01	0.07	0.15	0.28
Real exchange rate	-0.55	-0.78	-0.79	-0.71	-0.54	0.30
Terms of trade	-0.08	-0.17	-0.17	-0.13	-0.07	0.20
Miscellaneous						
Employment	0.02	0.11	0.25	0.40	0.49	0.03
Unemployment rate (level)	-0.01	-0.08	-0.17	-0.27	-0.31	0.01
Government balance ($b)*	-1.98	-1.36	-0.42	0.39	0.85	-1.12
Government debt to GDP (level)	0.42	0.72	0.75	0.60	0.40	0.21
Current account ($b)	0.01	-0.16	-0.86	-1.84	-2.71	-2.76
Trade balance ($b)	-0.06	-0.28	-1.00	-1.90	-2.62	-1.81
Investment income balance ($b)	0.07	0.12	0.13	0.06	-0.09	-0.96
Foreign debt to GDP (level)	0.18	0.23	0.25	0.36	0.60	2.21
Adjusted disposable income	0.13	0.49	0.65	0.76	0.77	0.18
Savings rate	0.16	-0.09	-0.27	-0.38	-0.45	-0.10

* Government balances are combined federal, PLH, and CPP/QPP balances, and are measured on a national accounts basis.

Table 4

10 Per Cent Reduction In Payroll Contributions

(percentage change from control unless otherwise specified)

Year	1	2	3	4	5	10	15
Real output and expenditures							
Potential output	0.00	0.01	0.03	0.06	0.10	0.20	0.04
Real GDP	0.03	0.13	0.27	0.36	0.42	0.06	-0.16
Consumption	0.04	0.24	0.50	0.70	0.85	0.66	0.34
Residential investment	0.08	0.63	1.09	1.48	1.72	0.53	0.19
Business investment	0.01	0.12	0.43	0.79	1.04	0.09	-1.57
Structure	0.03	0.14	0.43	0.77	1.06	0.71	-1.31
Machinery and equipment	0.01	0.11	0.44	0.81	1.03	-0.15	-1.66
Government expenditures	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Exports	0.08	0.07	-0.01	-0.07	-0.14	-0.54	-0.26
Imports	0.05	0.22	0.52	0.75	0.88	0.31	-0.08
Net exports to GDP (level)	0.01	-0.05	-0.16	-0.26	-0.34	-0.37	-0.09
Prices							
Commercial wage rate	0.06	0.17	0.28	0.35	0.45	1.10	0.99
User cost of capital	-0.10	0.19	0.43	0.63	0.65	0.41	0.62
GDP deflator	-0.13	-0.10	-0.05	-0.03	0.02	0.48	0.39
Consumer price index	-0.09	-0.09	-0.08	-0.09	-0.08	0.38	0.41
CPI inflation rate (level)	-0.09	-0.01	0.01	-0.01	0.01	0.09	-0.06
Short-term interest rate (level)	-0.03	0.00	0.06	0.09	0.12	0.17	0.08
Long-term interest rate (level)	-0.01	0.00	0.02	0.03	0.04	0.07	0.03
Real long-term interest rate (level)	0.04	0.05	0.00	0.03	0.04	-0.04	0.08
Exchange rate (US cents, + is app.)	-0.01	0.00	0.05	0.11	0.15	0.20	-0.02
Real exchange rate (+ is app.)	-0.14	-0.10	0.00	0.10	0.19	0.75	0.37
Terms of trade	-0.05	-0.03	0.01	0.05	0.08	0.28	0.12
Miscellaneous							
Employment	0.02	0.06	0.13	0.19	0.22	-0.06	-0.22
Unemployment rate (level)	-0.01	-0.04	-0.08	-0.12	-0.14	0.05	0.12
Government balance ($b)*	-1.54	-1.14	-1.02	-0.93	-0.98	-2.64	-4.85
Government debt to GDP (level)	0.19	0.34	0.40	0.47	0.51	1.13	3.16
Current account ($b)	-0.01	-0.32	-0.95	-1.50	-2.03	-3.23	-2.13
Trade balance ($b)	-0.02	-0.32	-0.88	-1.33	-1.74	-1.83	-0.27
Investment income balance ($b)	0.01	0.00	-0.07	-0.17	-0.30	-1.40	-1.86
Foreign debt to GDP (level)	0.03	0.02	0.05	0.19	0.39	2.12	3.08
Adjusted disposable income	0.11	0.39	0.59	0.73	0.85	0.58	0.55
Savings rate	0.26	0.12	0.02	-0.03	-0.03	0.06	0.19

* Government balances are combined federal, PLH, and CPP/QPP balances, and are measured on a national accounts basis.

Table 5

10 Percentage Point Reduction In The Corporate Tax Rate

(percentage change from control unless otherwise specified)

Year	1	2	3	4	5	10	15
Real output and expenditures							
Potential output	-0.01	0.08	0.23	0.39	0.53	1.04	1.10
Real GDP	0.25	0.44	0.51	0.56	0.62	0.61	0.65
Consumption	0.02	0.12	0.32	0.57	0.81	0.78	0.40
Residential investment	0.15	0.66	1.14	1.42	1.58	0.62	0.26
Business investment	1.43	4.21	5.94	7.02	7.46	6.76	4.34
Structure	1.29	4.43	6.79	8.58	9.83	12.15	9.42
Machinery and equipment	1.52	4.06	5.35	6.01	6.15	4.71	2.60
Government expenditures	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Exports	-0.02	-0.10	-0.17	-0.23	-0.25	-0.30	0.31
Imports	0.61	1.60	1.97	2.31	2.30	1.56	1.00
Net exports to GDP (level)	-0.18	-0.50	-0.65	-0.81	-0.85	-0.79	-0.32
Prices							
Commercial wage rate	0.01	0.05	0.10	0.12	0.12	0.08	-0.72
User cost of capital	-10.17	-9.54	-9.48	-9.21	-9.09	-8.34	-8.83
GDP deflator	0.00	0.01	0.03	0.00	-0.03	-0.22	-0.92
Consumer price index	-0.01	-0.01	-0.02	-0.05	-0.09	-0.25	-0.87
CPI inflation rate (level)	-0.01	-0.01	-0.01	-0.03	-0.04	-0.02	-0.20
Short-term interest rate (level)	0.07	0.12	0.14	0.15	0.16	0.09	-0.12
Long-term interest rate (level)	0.02	0.04	0.05	0.06	0.06	0.04	-0.04
Real long-term interest rate (level)	0.02	0.05	0.06	0.08	0.10	0.06	0.14
Exchange rate (US cents, + is app.)	0.02	0.09	0.17	0.24	0.27	0.40	0.32
Real exchange rate (+ is app.)	0.03	0.12	0.22	0.27	0.29	0.33	-0.51
Terms of trade	0.02	0.08	0.13	0.16	0.16	0.18	-0.16
Miscellaneous							
Employment	0.09	0.24	0.26	0.21	0.16	-0.07	-0.16
Unemployment rate (level)	-0.06	-0.15	-0.15	-0.12	-0.10	0.06	0.09
Government balance ($b)*	-4.84	-5.29	-4.38	-3.95	-3.74	-7.74	-10.75
Government debt to GDP (level)	0.41	1.07	1.68	2.22	2.67	5.78	10.18
Current account ($b)	-1.02	-2.92	-3.96	-4.87	-5.55	-8.70	-8.27
Trade balance ($b)	-0.97	-2.68	-3.43	-4.08	-4.43	-5.09	-3.39
Investment income balance ($b)	-0.06	-0.24	-0.53	-0.80	-1.12	-3.60	-4.88
Foreign debt to GDP (level)	-0.01	0.26	0.75	1.38	2.08	6.60	9.72
Adjusted disposable income	0.04	0.26	0.54	0.81	1.00	0.69	0.45
Savings rate	0.16	0.28	0.30	0.17	0.08	-0.13	-0.06

* Government balances are combined federal, PLH, and CPP/QPP balances, and are measured on a national accounts basis.

Table 6

Government Expenditure And Tax Multipliers

(The Impact on Real GDP of a $1 increase in the Real Fiscal Instrument)

	Multipliers (in dollar)						
Year	1	2	3	4	5	10	15
Government expenditure	0.45	0.76	0.93	0.96	0.93	-0.23	-0.50
Personal income tax	0.06	0.41	0.94	1.42	1.72	0.04	-0.65
Goods and services tax	0.10	0.47	1.07	1.59	1.84	0.31	NA
Payroll contributions	0.10	0.44	0.79	0.95	0.97	0.12	-0.31
Corporate income tax	0.30	0.49	0.68	0.86	1.05	0.75	0.78
	Cumulative multipliers						
Government expenditure	0.45	1.21	2.14	3.10	4.03	5.91	2.98
Personal income tax	0.06	0.47	1.41	2.83	4.55	9.53	6.09
Goods and services tax	0.10	0.56	1.64	3.23	5.07	10.71	NA
Payroll contributions	0.10	0.53	1.32	2.27	3.24	6.39	4.78
Corporate income tax	0.30	0.79	1.46	2.32	3.37	8.31	11.59

Table 7

1 Per Cent Increase In The Level Of Money

(percentage change from control unless otherwise specified)

Year	1	2	3	4	5	10	15
Real output and expenditures							
Potential output	0.00	0.02	0.04	0.07	0.10	0.17	0.07
Real GDP	0.04	0.20	0.29	0.29	0.26	-0.01	-0.06
Consumption	0.05	0.27	0.31	0.26	0.24	-0.03	-0.13
Residential investment	0.16	0.76	0.64	0.62	0.60	-0.33	-0.25
Business investment	0.10	0.57	1.17	1.54	1.69	0.47	-0.53
Structure	0.08	0.54	1.14	1.60	1.93	1.28	-0.17
Machinery and equipment	0.11	0.59	1.18	1.50	1.57	0.16	-0.65
Government expenditures	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Exports	0.08	0.16	0.16	0.12	0.06	-0.11	0.10
Imports	0.11	0.45	0.53	0.53	0.47	-0.04	-0.16
Net exports to GDP (level)	-0.01	-0.09	-0.11	-0.13	-0.13	-0.03	0.12
Prices							
Commercial wage rate	0.02	0.10	0.22	0.37	0.51	1.02	0.95
User cost of capital	-0.68	-0.83	-0.57	-0.62	-0.57	0.16	0.61
GDP deflator	0.03	0.12	0.24	0.36	0.48	0.91	0.89
Consumer price index	0.03	0.11	0.20	0.31	0.41	0.87	0.90
CPI inflation rate (level)	0.04	0.08	0.10	0.11	0.10	0.08	-0.04
Short-term interest rate (level)	-0.30	-0.22	-0.16	-0.12	-0.09	-0.03	-0.05
Long-term interest rate (level)	-0.08	-0.09	-0.07	-0.05	-0.04	-0.01	-0.02
Real long-term interest rate (level)	-0.10	-0.16	-0.16	-0.16	-0.15	-0.10	0.01
Exchange rate (US cents, + is app.)	-0.13	-0.29	-0.39	-0.46	-0.46	-0.54	-0.76
Real exchange rate (+ is app.)	-0.13	-0.23	-0.22	-0.17	-0.08	0.17	-0.11
Terms of trade	-0.07	-0.11	-0.10	-0.07	-0.02	0.05	-0.05
Miscellaneous							
Employment	0.01	0.09	0.17	0.19	0.16	-0.07	-0.11
Unemployment rate (level)	-0.01	-0.06	-0.11	-0.11	-0.10	0.05	0.06
Government balance ($b)*	0.35	1.04	1.42	1.47	1.40	0.41	-0.16
Government debt to GDP (level)	-0.06	-0.27	-0.56	-0.86	-1.16	-1.89	-1.45
Current account ($b)	-0.04	-0.58	-0.74	-0.81	-0.83	-0.01	1.26
Trade balance ($b)	-0.15	-0.69	-0.82	-0.86	-0.84	0.15	1.26
Investment income balance ($b)	0.11	0.11	0.08	0.06	0.02	-0.16	0.00
Foreign debt to GDP (level)	-0.03	-0.05	-0.03	0.02	0.07	0.38	-0.02
Adjusted disposable income	-0.02	-0.08	-0.13	-0.13	-0.07	-0.17	-0.07
Savings rate	-0.13	-0.32	-0.30	-0.20	-0.12	-0.01	0.03

* Government balances are combined federal, PLH, and CPP/QPP balances, and are measured on a national accounts basis.

Table 8

100 Basis Point Permanent Increase In The Short-Term Interest Rate

(percentage change from control unless otherwise specified)

Year	1	2	3	4	5	10	15
Real output and expenditures							
Potential output	-0.01	-0.07	-0.15	-0.27	-0.43	-1.13	-1.08
Real GDP	-0.14	-0.70	-1.15	-1.38	-1.49	-1.02	-0.40
Consumption	-0.16	-0.94	-1.29	-1.39	-1.51	-0.83	0.43
Residential investment	-0.53	-2.66	-2.85	-3.24	-3.64	-0.65	0.93
Business investment	-0.31	-1.94	-4.28	-6.31	-7.92	-7.86	-3.14
Structure	-0.26	-1.83	-4.15	-6.42	-8.58	-12.17	-8.29
Machinery and equipment	-0.35	-2.02	-4.36	-6.24	-7.56	-6.23	-1.37
Government expenditures	0.00	0.00	0.00	0.01	0.01	0.00	0.02
Exports	-0.28	-0.60	-0.73	-0.74	-0.63	-0.13	-0.79
Imports	-0.36	-1.58	-2.17	-2.54	-2.71	-1.65	-0.38
Net exports to GDP (level)	0.03	0.30	0.45	0.58	0.71	0.67	-0.19
Prices							
Commercial wage rate	-0.06	-0.34	-0.82	-1.50	-2.24	-6.32	-9.08
User cost of capital	2.27	3.31	3.02	3.91	4.38	1.47	-1.03
GDP deflator	-0.10	-0.43	-0.91	-1.50	-2.15	-5.81	-8.42
Consumer price index	-0.11	-0.39	-0.79	-1.30	-1.85	-5.36	-8.18
CPI inflation rate (level)	-0.12	-0.29	-0.42	-0.54	-0.57	-0.86	-0.40
Short-term interest rate (level)	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Long-term interest rate (level)	0.27	0.38	0.39	0.39	0.39	0.39	0.39
Real long-term interest rate (level)	0.33	0.62	0.75	0.90	0.94	1.24	0.83
Exchange rate (US cents, + is app.)	0.45	1.10	1.68	2.29	2.56	4.57	7.84
Real exchange rate (+ is app.)	0.44	0.87	1.03	1.08	0.87	0.06	0.92
Terms of trade	0.24	0.44	0.48	0.45	0.33	0.11	0.42
Miscellaneous							
Employment	-0.04	-0.30	-0.65	-0.83	-0.88	-0.27	0.36
Unemployment rate (level)	0.03	0.21	0.42	0.52	0.55	0.13	-0.19
Government balance ($b)*	-1.14	-3.76	-5.76	-6.99	-7.86	-9.90	-8.23
Government debt to GDP (level)	0.18	0.96	2.17	3.69	5.50	14.46	18.00
Current account ($b)	0.11	1.91	2.76	3.46	4.05	2.67	-5.15
Trade balance ($b)	0.50	2.36	3.27	4.00	4.57	2.83	-4.09
Investment income balance ($b)	-0.38	-0.46	-0.51	-0.54	-0.53	-0.16	-1.06
Foreign debt to GDP (level)	0.09	0.21	0.20	0.11	-0.01	-1.65	-0.19
Adjusted disposable income	0.06	0.27	0.52	0.67	0.55	1.69	1.67
Savings rate	0.41	1.16	1.39	1.29	1.15	1.29	0.63

* Government balances are combined federal, PLH, and CPP/QPP balances, and are measured on a national accounts basis.

Table 9

100 Basis Point Temporary Increase In The Short-Term Interest Rate

(percentage change from control unless otherwise specified)

Year	1	2	3	4	5	10	15
Real output and expenditures							
Potential output	-0.01	-0.06	-0.08	-0.13	-0.18	-0.15	-0.01
Real GDP	-0.14	-0.56	-0.47	-0.30	-0.18	0.14	0.03
Consumption	-0.16	-0.78	-0.36	-0.13	-0.11	0.19	0.04
Residential investment	-0.53	-2.14	-0.26	-0.63	-0.34	0.67	-0.03
Business investment	-0.31	-1.63	-2.43	-2.30	-1.87	0.39	0.84
Structure	-0.26	-1.57	-2.41	-2.56	-2.43	-0.42	0.87
Machinery and equipment	-0.35	-1.68	-2.44	-2.13	-1.56	0.70	0.83
Government expenditures	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Exports	-0.28	-0.32	-0.15	-0.02	0.07	0.11	-0.12
Imports	-0.36	-1.23	-0.69	-0.46	-0.29	0.28	0.15
Net exports to GDP (level)	0.03	0.27	0.16	0.14	0.12	-0.07	-0.13
Prices							
Commercial wage rate	-0.06	-0.28	-0.48	-0.69	-0.84	-1.08	-0.68
User cost of capital	2.27	0.97	0.07	0.28	0.21	-0.41	-1.08
GDP deflator	-0.10	-0.33	-0.50	-0.65	-0.76	-0.97	-0.66
Consumer price index	-0.11	-0.27	-0.41	-0.55	-0.66	-0.96	-0.69
CPI inflation rate (level)	-0.12	-0.17	-0.14	-0.15	-0.11	-0.03	0.09
Short-term interest rate (level)	1.00	0.00	0.00	0.00	0.00	0.00	0.00
Long-term interest rate (level)	0.27	0.10	0.01	0.00	0.00	0.00	0.00
Real long-term interest rate (level)	0.33	0.28	0.15	0.15	0.12	0.04	-0.09
Exchange rate (US cents, + is app.)	0.45	0.65	0.59	0.58	0.53	0.59	0.64
Real exchange rate (+ is app.)	0.44	0.44	0.18	0.01	-0.12	-0.18	0.16
Terms of trade	0.24	0.20	0.06	-0.01	-0.06	-0.05	0.06
Miscellaneous							
Employment	-0.04	-0.26	-0.36	-0.23	-0.10	0.18	0.06
Unemployment rate (level)	0.03	0.18	0.21	0.13	0.04	-0.11	-0.03
Government balance ($b)*	-1.14	-2.50	-2.26	-1.59	-1.05	0.57	0.58
Government debt to GDP (level)	0.18	0.76	1.19	1.50	1.73	1.77	0.92
Current account ($b)	0.11	1.80	1.05	0.87	0.74	-0.69	-1.23
Trade balance ($b)	0.50	1.85	1.03	0.79	0.61	-0.87	-1.21
Investment income balance ($b)	-0.38	-0.04	0.01	0.08	0.13	0.18	-0.02
Foreign debt to GDP (level)	0.09	0.12	-0.04	-0.15	-0.22	-0.35	0.21
Adjusted disposable income	0.06	0.21	0.23	0.13	-0.01	0.17	-0.11
Savings rate	0.41	0.73	0.19	-0.06	-0.04	-0.10	-0.04

* Government balances are combined federal, PLH, and CPP/QPP balances, and are measured on a national accounts basis.

Table 10

1 Per Cent Appreciation In The Nominal Exchange Rate

(percentage change from control unless otherwise specified)

Year	1	2	3	4	5	10	15
Real output and expenditures							
Potential output	0.01	0.02	0.01	0.00	-0.02	-0.01	0.06
Real GDP	-0.09	-0.18	-0.12	-0.05	-0.02	0.01	0.10
Consumption	0.00	0.08	0.23	0.28	0.24	0.08	0.08
Residential investment	-0.04	0.05	0.05	0.11	0.12	0.02	0.11
Business investment	-0.04	-0.43	-0.68	-0.64	-0.43	0.45	1.06
Structure	-0.09	-0.46	-0.74	-0.82	-0.75	0.10	0.99
Machinery and equipment	0.00	-0.40	-0.63	-0.52	-0.25	0.58	1.09
Government expenditures	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Exports	-0.50	-0.42	-0.31	-0.22	-0.17	-0.02	0.02
Imports	-0.05	0.09	0.19	0.24	0.24	0.22	0.31
Net exports to GDP (level)	-0.13	-0.15	-0.15	-0.15	-0.14	-0.11	-0.14
Prices							
Commercial wage rate	-0.15	-0.39	-0.54	-0.68	-0.77	-0.99	-1.05
User cost of capital	-0.47	-0.42	-0.40	-0.39	-0.91	-1.83	-2.15
GDP deflator	-0.23	-0.44	-0.57	-0.67	-0.74	-0.94	-0.99
Consumer price index	-0.25	-0.39	-0.52	-0.62	-0.69	-0.89	-0.95
CPI inflation rate (level)	-0.26	-0.15	-0.13	-0.11	-0.07	-0.03	0.00
Short-term interest rate (level)	-0.10	-0.19	-0.21	-0.23	-0.24	-0.30	-0.29
Long-term interest rate (level)	-0.02	-0.06	-0.08	-0.09	-0.09	-0.12	-0.11
Real long-term interest rate (level)	0.13	0.16	0.05	0.03	-0.01	-0.08	-0.11
Exchange rate (US cents, + is app.)	0.82	0.85	0.87	0.88	0.84	0.74	0.78
Real exchange rate (+ is app.)	0.78	0.57	0.44	0.34	0.27	0.06	0.01
Terms of trade	0.42	0.24	0.17	0.11	0.08	0.02	0.00
Miscellaneous							
Employment	-0.04	-0.14	-0.15	-0.09	-0.04	-0.01	0.03
Unemployment rate (level)	0.03	0.09	0.08	0.04	0.02	0.00	-0.02
Government balance ($b)*	-0.37	-0.52	-0.27	0.26	0.60	1.24	1.56
Government debt to GDP (level)	0.16	0.35	0.46	0.50	0.51	0.20	-0.57
Current account ($b)	-0.04	-0.37	-0.47	-0.43	-0.42	-0.62	-1.31
Trade balance ($b)	-0.08	-0.42	-0.54	-0.52	-0.56	-0.95	-1.54
Investment income balance ($b)	0.04	0.06	0.07	0.10	0.14	0.33	0.23
Foreign debt to GDP (level)	0.10	0.25	0.36	0.46	0.56	0.84	1.09
Adjusted disposable income	0.05	0.19	0.16	0.05	-0.09	-0.30	-0.30
Savings rate	0.05	-0.16	-0.38	-0.43	-0.38	-0.37	-0.38

* Government balances are combined federal, PLH, and CPP/QPP balances, and are measured on a national accounts basis.

Table 11

1 Per Cent Decline In The U.S. Real Activity

(percentage change from control unless otherwise specified)

Year	1	2	3	4	5	10	15
Real output and expenditures							
Potential output	0.00	0.00	-0.01	-0.04	-0.07	-0.08	0.03
Real GDP	-0.13	-0.21	-0.24	-0.22	-0.20	0.08	0.10
Consumption	-0.01	-0.01	-0.02	-0.06	-0.09	0.18	0.19
Residential investment	-0.08	-0.19	-0.35	-0.40	-0.38	0.52	0.30
Business investment	-0.15	-0.57	-0.86	-0.98	-0.94	0.12	0.82
Structure	-0.14	-0.50	-0.81	-0.99	-1.04	-0.25	0.88
Machinery and equipment	-0.15	-0.61	-0.90	-0.98	-0.88	0.26	0.79
Government expenditures	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Exports	-1.28	-1.05	-0.95	-0.86	-0.82	-0.66	-0.81
Imports	-0.74	-0.63	-0.70	-0.76	-0.78	-0.49	-0.48
Net exports to GDP (level)	-0.15	-0.11	-0.06	-0.02	0.00	-0.08	-0.16
Prices							
Commercial wage rate	-0.03	-0.10	-0.17	-0.26	-0.35	-0.79	-0.68
User cost of capital	-0.09	-0.20	-0.30	-0.35	-0.45	-0.34	-0.87
GDP deflator	-0.02	-0.07	-0.12	-0.18	-0.25	-0.58	-0.51
Consumer price index	-0.05	-0.08	-0.13	-0.18	-0.25	-0.68	-0.70
CPI inflation rate (level)	-0.05	-0.03	-0.05	-0.06	-0.07	-0.07	0.03
Short-term interest rate (level)	-0.04	-0.08	-0.10	-0.12	-0.13	-0.16	-0.14
Long-term interest rate (level)	-0.01	-0.03	-0.04	-0.04	-0.05	-0.06	-0.05
Real long-term interest rate (level)	0.02	0.02	0.00	0.01	0.01	0.02	-0.08
Exchange rate (US cents, + is app.)	-0.01	-0.05	-0.09	-0.13	-0.14	-0.09	0.03
Real exchange rate (+ is app.)	-0.04	-0.13	-0.23	-0.33	-0.42	-0.70	-0.48
Terms of trade	0.00	-0.03	-0.08	-0.13	-0.15	-0.25	-0.18
Miscellaneous							
Employment	-0.05	-0.12	-0.16	-0.15	-0.11	0.10	0.12
Unemployment rate (level)	0.03	0.08	0.10	0.09	0.07	-0.07	-0.06
Government balance ($b)*	-0.35	-0.63	-0.77	-0.69	-0.60	0.42	0.66
Government debt to GDP (level)	0.09	0.22	0.37	0.52	0.66	0.83	0.26
Current account ($b)	-0.93	-0.81	-0.66	-0.45	-0.40	-1.58	-3.00
Trade balance ($b)	-0.89	-0.73	-0.55	-0.35	-0.31	-1.46	-2.35
Investment income balance ($b)	-0.03	-0.08	-0.11	-0.10	-0.09	-0.12	-0.65
Foreign debt to GDP (level)	0.14	0.32	0.46	0.56	0.64	1.06	2.05
Adjusted disposable income	0.00	-0.01	-0.07	-0.14	-0.18	0.02	-0.11
Savings rate	-0.01	-0.09	-0.14	-0.13	-0.12	-0.26	-0.24

* Government balances are combined federal, PLH, and CPP/QPP balances, and are measured on a national accounts basis.

Table 12

20 Per Cent Increase In The World Oil Price

(percentage change from control unless otherwise specified)

Year	1	2	3	4	5	10	15
Real output and expenditures							
Potential output	0.00	0.00	-0.01	-0.01	-0.03	-0.08	-0.04
Real GDP	-0.04	-0.08	-0.21	-0.31	-0.33	-0.11	-0.03
Consumption	-0.01	-0.09	-0.25	-0.34	-0.34	-0.05	0.05
Residential investment	-0.03	-0.26	-0.50	-0.70	-0.74	0.08	0.19
Business investment	-0.03	-0.02	-0.19	-0.49	-0.74	-0.29	0.30
Structure	-0.05	-0.10	-0.29	-0.59	-0.87	-1.11	-0.68
Machinery and equipment	-0.02	0.03	-0.12	-0.42	-0.67	0.02	0.64
Government expenditures	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Exports	-0.25	-0.26	-0.28	-0.27	-0.22	-0.10	-0.13
Imports	-0.12	-0.12	-0.24	-0.32	-0.36	0.00	0.12
Net exports to GDP (level)	-0.03	-0.04	-0.01	0.02	0.04	-0.04	-0.12
Prices							
Commercial wage rate	0.11	0.28	0.35	0.38	0.36	0.19	0.17
User cost of capital	0.11	-0.13	-0.36	-0.57	-0.23	0.33	0.36
GDP deflator	0.22	0.37	0.44	0.46	0.45	0.31	0.27
Consumer price index	0.20	0.31	0.39	0.43	0.45	0.38	0.34
CPI inflation rate (level)	0.21	0.12	0.09	0.04	0.02	-0.01	0.00
Short-term interest rate (level)	0.06	0.10	0.08	0.06	0.05	0.07	0.08
Long-term interest rate (level)	0.02	0.03	0.03	0.03	0.02	0.03	0.03
Real long-term interest rate (level)	-0.11	-0.14	-0.06	-0.03	0.00	0.04	0.04
Exchange rate (US cents, + is app.)	0.09	0.10	0.06	0.01	-0.05	-0.10	-0.05
Real exchange rate (+ is app.)	0.33	0.49	0.52	0.47	0.39	0.18	0.21
Terms of trade	0.67	0.90	0.85	0.84	0.78	0.68	0.68
Miscellaneous							
Employment	-0.01	-0.01	-0.08	-0.16	-0.19	-0.02	0.03
Unemployment rate (level)	0.00	0.01	0.05	0.10	0.12	0.01	-0.02
Government balance ($b)*	0.68	0.69	0.32	-0.26	-0.48	0.92	2.15
Government debt to GDP (level)	-0.14	-0.29	-0.33	-0.31	-0.23	-0.47	-1.22
Current account ($b)	0.90	1.34	1.55	1.73	2.00	3.14	3.89
Trade balance ($b)	0.88	1.23	1.36	1.46	1.65	2.08	2.13
Investment income balance ($b)	0.02	0.10	0.19	0.27	0.36	1.06	1.76
Foreign debt to GDP (level)	-0.14	-0.36	-0.55	-0.78	-1.03	-2.49	-3.79
Adjusted disposable income	-0.05	-0.18	-0.22	-0.20	-0.13	0.10	0.13
Savings rate	-0.05	0.08	0.21	0.25	0.23	0.06	0.05

* Government balances are combined federal, PLH, and CPP/QPP balances, and are measured on a national accounts basis.

Table 13

1 Per Cent Increase In The Level Of Total Factor Productivity

(percentage change from control unless otherwise specified)

Year	1	2	3	4	5	10	15
Real output and expenditures							
Potential output	0.71	0.73	0.70	0.68	0.69	0.82	0.90
Real GDP	0.32	0.28	0.58	0.85	0.94	0.85	0.98
Consumption	-0.01	0.17	0.68	1.03	1.16	0.98	1.00
Residential investment	-0.26	-0.15	0.52	1.38	1.77	1.08	1.28
Business investment	-0.03	-0.77	-1.18	-0.76	-0.08	0.86	1.06
Structure	0.00	-0.77	-1.16	-0.98	-0.57	0.79	1.30
Machinery and equipment	-0.04	-0.77	-1.19	-0.61	0.20	0.89	0.98
Government expenditures	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Exports	0.50	0.88	0.92	0.78	0.58	0.52	0.67
Imports	0.00	-0.45	-0.34	-0.03	0.30	0.34	0.35
Net exports to GDP (level)	0.14	0.39	0.38	0.26	0.10	0.08	0.14
Prices							
Commercial wage rate	-0.19	-0.40	-0.29	-0.02	0.26	0.02	-0.39
User cost of capital	-0.71	-0.23	0.32	0.85	-0.26	-1.31	-1.63
GDP deflator	-0.87	-1.29	-1.39	-1.31	-1.15	-1.27	-1.57
Consumer price index	-0.57	-0.94	-1.12	-1.18	-1.13	-1.32	-1.65
CPI inflation rate (level)	-0.59	-0.39	-0.19	-0.05	0.04	-0.05	-0.08
Short-term interest rate (level)	-0.19	-0.34	-0.29	-0.19	-0.12	-0.18	-0.24
Long-term interest rate (level)	-0.05	-0.12	-0.12	-0.09	-0.06	-0.07	-0.09
Real long-term interest rate (level)	0.29	0.44	0.11	0.02	-0.08	-0.01	-0.01
Exchange rate (US cents, + is app.)	-0.03	-0.08	-0.02	0.11	0.23	0.39	0.49
Real exchange rate (+ is app.)	-0.91	-1.38	-1.41	-1.18	-0.87	-0.75	-0.94
Terms of trade	-0.30	-0.50	-0.51	-0.41	-0.30	-0.32	-0.41
Miscellaneous							
Employment	-0.14	-0.33	-0.27	-0.09	0.01	-0.10	-0.04
Unemployment rate (level)	0.10	0.21	0.15	0.03	-0.02	0.06	0.02
Government balance ($b)*	-0.24	-0.29	0.80	2.17	2.93	3.15	3.72
Government debt to GDP (level)	0.23	0.48	0.37	0.00	-0.49	-2.00	-3.24
Current account ($b)	0.41	1.61	1.70	1.15	0.49	0.25	0.29
Trade balance ($b)	0.33	1.36	1.28	0.65	-0.05	-0.49	-0.49
Investment income balance ($b)	0.08	0.25	0.42	0.50	0.54	0.73	0.78
Foreign debt to GDP (level)	0.16	0.15	-0.17	-0.48	-0.66	-0.57	-0.62
Adjusted disposable income	0.12	0.56	0.79	0.82	0.79	0.62	0.61
Savings rate	0.17	-0.09	-0.43	-0.49	-0.41	-0.33	-0.38

* Government balances are combined federal, PLH, and CPP/QPP balances, and are measured on a national accounts basis.

Table 14

Increase In Government Expenditures Equivalent To 1 Per Cent Of Real GDP

Alternative Monetary Policy Rule

(percentage change from control unless otherwise specified)

Year	1	2	3	4	5	10	15
Real output and expenditures							
Potential output	0.00	0.01	0.10	0.22	0.35	0.64	0.19
Real GDP	0.46	0.84	1.12	1.25	1.31	0.10	-0.40
Consumption	0.04	0.23	0.55	0.89	1.21	0.12	-0.80
Residential investment	0.33	1.31	2.34	2.94	3.37	-0.98	-1.63
Business investment	0.53	2.09	3.59	4.70	5.29	1.73	-2.79
Structure	0.52	1.87	3.40	4.72	5.75	4.62	-1.06
Machinery and equipment	0.54	2.23	3.72	4.68	5.05	0.64	-3.38
Government expenditures	4.63	4.54	4.37	4.17	4.16	4.86	5.10
Exports	-0.03	-0.12	-0.27	-0.43	-0.62	-1.45	-0.54
Imports	1.73	2.20	2.75	3.23	3.37	1.18	0.24
Net exports to GDP (level)	-0.51	-0.68	-0.90	-1.14	-1.31	-1.14	-0.36
Prices							
Commercial wage rate	0.03	0.16	0.40	0.72	1.09	3.61	3.88
User cost of capital	0.15	0.50	0.89	1.00	1.19	0.69	2.11
GDP deflator	0.01	0.13	0.35	0.61	0.93	3.00	3.40
Consumer price index	0.02	0.08	0.20	0.34	0.58	2.71	3.46
CPI inflation rate (level)	0.02	0.06	0.13	0.15	0.24	0.43	-0.04
Short-term interest rate (level)	0.02	0.04	0.09	0.07	0.14	0.20	-0.03
Long-term interest rate (level)	0.00	0.01	0.03	0.03	0.05	0.08	-0.01
Real long-term interest rate (level)	0.00	-0.03	-0.07	-0.12	-0.15	-0.36	0.00
Exchange rate (US cents, + is app.)	0.01	0.02	0.03	0.00	-0.04	-0.67	-1.95
Real exchange rate (+ is app.)	0.02	0.16	0.39	0.61	0.88	2.06	0.78
Terms of trade	0.02	0.08	0.16	0.24	0.33	0.74	0.26
Miscellaneous							
Employment	0.17	0.48	0.71	0.78	0.77	-0.18	-0.55
Unemployment rate (level)	-0.12	-0.31	-0.43	-0.47	-0.47	0.15	0.29
Government balance ($b)*	-4.75	-4.05	-3.52	-3.40	-3.29	-8.21	-13.35
Government debt to GDP (level)	0.31	0.73	1.00	1.21	1.28	2.82	8.20
Current account ($b)	-2.85	-4.11	-5.64	-6.97	-8.38	-10.53	-7.15
Trade balance ($b)	-2.72	-3.73	-4.88	-5.89	-6.83	-5.59	-1.02
Investment income balance ($b)	-0.13	-0.38	-0.76	-1.07	-1.54	-4.95	-6.13
Foreign debt to GDP (level)	0.11	0.47	0.99	1.72	2.56	8.05	10.77
Adjusted disposable income	0.04	0.22	0.49	0.74	0.96	-0.28	-0.33
Savings rate	0.12	0.19	0.15	0.03	-0.08	0.26	0.50

* Government balances are combined federal, PLH, and CPP/QPP balances, and are measured on a national accounts basis.

Table 15

Reduction In Personal Income Taxes Equivalent To 1 Per Cent Of Real GDP

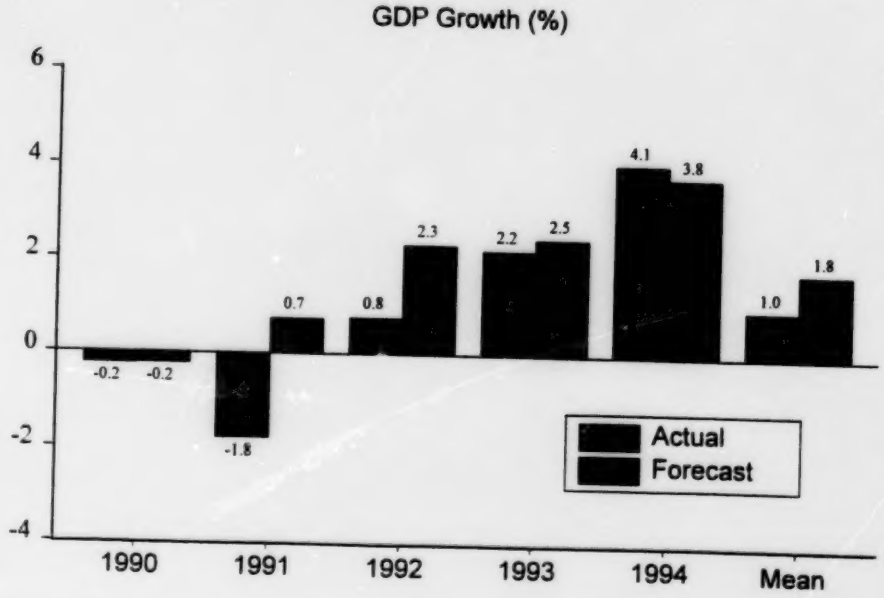
Alternative Monetary Policy Rule

(percentage change from control unless otherwise specified)

Year	1	2	3	4	5	10	15
Real output and expenditures							
Potential output	0.01	0.07	0.16	0.28	0.43	0.98	0.44
Real GDP	0.06	0.43	1.00	1.53	1.90	0.49	-0.55
Consumption	0.17	1.01	2.08	3.02	3.67	2.36	0.60
Residential investment	0.30	2.55	4.70	6.41	7.60	1.89	-0.37
Business investment	0.02	0.50	1.88	3.74	5.54	2.96	-4.18
Structure	0.02	0.47	1.73	3.52	5.46	6.17	-2.00
Machinery and equipment	0.02	0.52	1.98	3.89	5.60	1.75	-4.92
Government expenditures	0.00	0.00	0.00	0.00	0.00	0.01	0.00
Exports	0.00	-0.01	-0.07	-0.19	-0.40	-1.69	-0.62
Imports	0.17	1.17	2.42	3.55	4.23	1.53	-0.37
Net exports to GDP (level)	-0.05	-0.35	-0.75	-1.16	-1.51	-1.39	-0.12
Prices							
Commercial wage rate	0.00	0.00	0.05	0.26	0.58	3.73	4.14
User cost of capital	-0.01	0.12	0.58	1.08	1.69	0.60	1.65
GDP deflator	0.00	0.00	0.07	0.25	0.54	3.13	3.66
Consumer price index	-0.01	-0.03	-0.04	0.01	0.16	2.65	3.68
CPI inflation rate (level)	-0.01	-0.03	0.00	0.04	0.16	0.56	-0.07
Short-term interest rate (level)	-0.01	-0.01	0.03	0.01	0.11	0.27	-0.06
Long-term interest rate (level)	0.00	-0.01	0.00	0.01	0.03	0.11	-0.01
Real long-term interest rate (level)	0.00	0.02	0.03	-0.04	-0.07	-0.46	0.01
Exchange rate (US cents, + is app.)	0.00	-0.01	-0.01	-0.01	-0.01	-0.50	-2.02
Real exchange rate (+ is app.)	-0.01	-0.01	0.05	0.24	0.53	2.42	0.93
Terms of trade	0.00	0.00	0.04	0.12	0.23	0.86	0.28
Miscellaneous							
Employment	0.01	0.15	0.45	0.77	1.01	-0.06	-0.86
Unemployment rate (level)	-0.01	-0.10	-0.30	-0.50	-0.65	0.09	0.48
Government balance ($b)*	-6.11	-5.72	-4.36	-2.60	-1.07	-5.63	-13.28
Government debt to GDP (level)	0.60	1.32	1.71	1.76	1.41	0.90	6.35
Current account ($b)	-0.27	-2.03	-4.52	-6.89	-9.36	-12.22	-5.20
Trade balance ($b)	-0.27	-1.95	-4.20	-6.27	-8.24	-7.05	1.12
Investment income balance ($b)	0.00	-0.08	-0.32	-0.62	-1.11	-5.18	-6.32
Foreign debt to GDP (level)	0.00	0.06	0.34	0.90	1.72	8.26	10.99
Adjusted disposable income	0.49	1.59	2.38	2.85	2.99	1.32	0.91
Savings rate	1.25	0.61	-0.10	-0.62	-0.77	-0.19	0.42

* Government balances are combined federal, PLH, and CPP/QPP balances, and are measured on a national accounts basis.

Chart 1
Long-Term Forecast For GDP Growth And Inflation



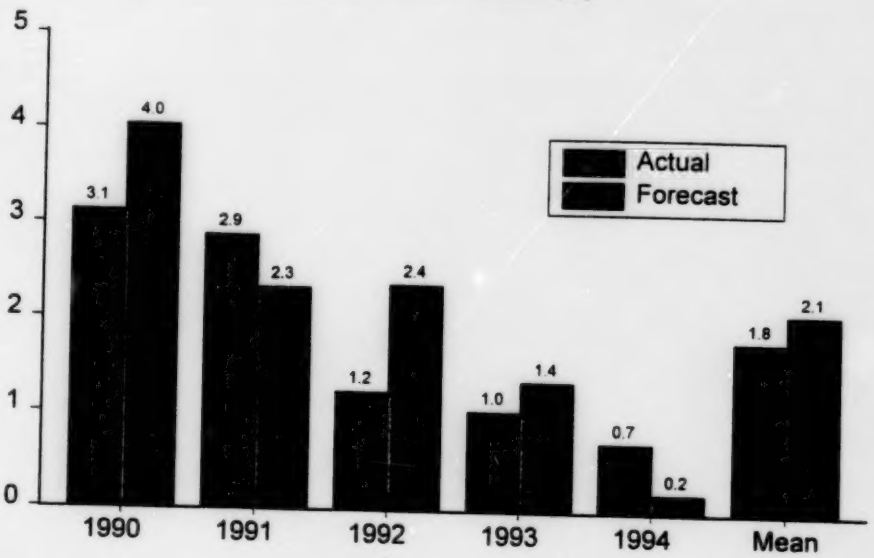
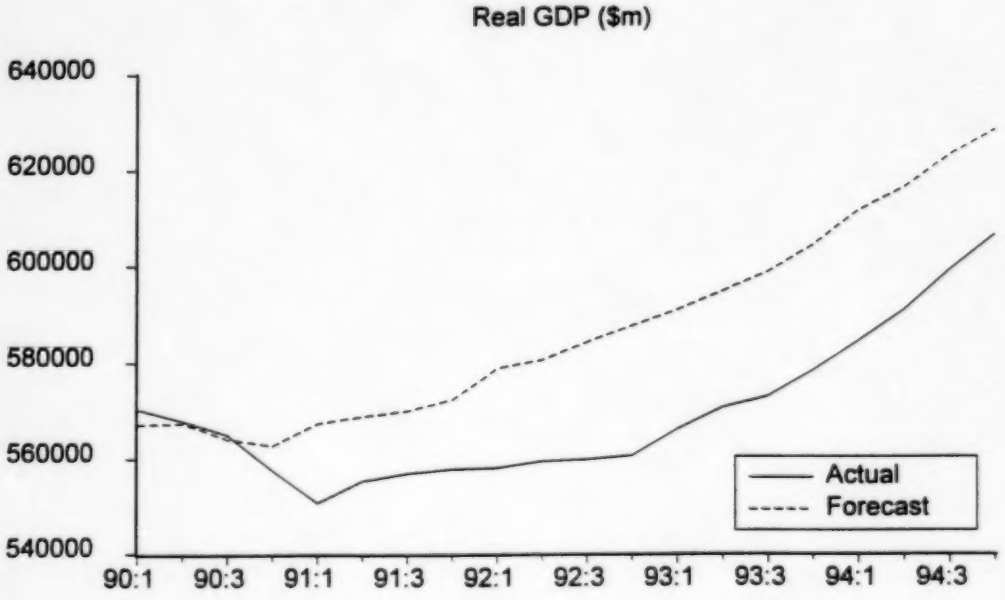


Chart 2
Long-Term Forecasts For Output And Prices



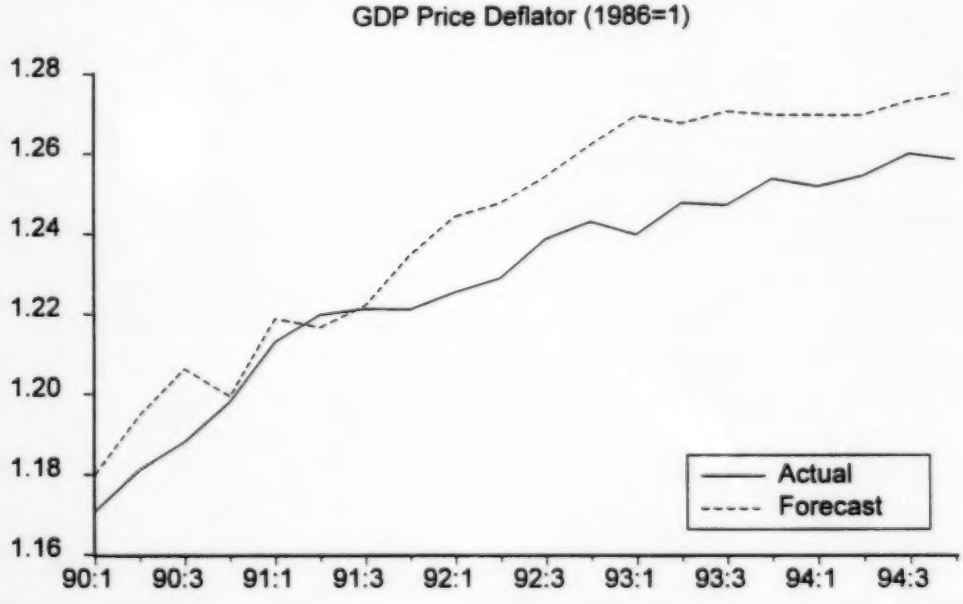


Chart 3
Long-Term Forecast: Detailed Results ($m)

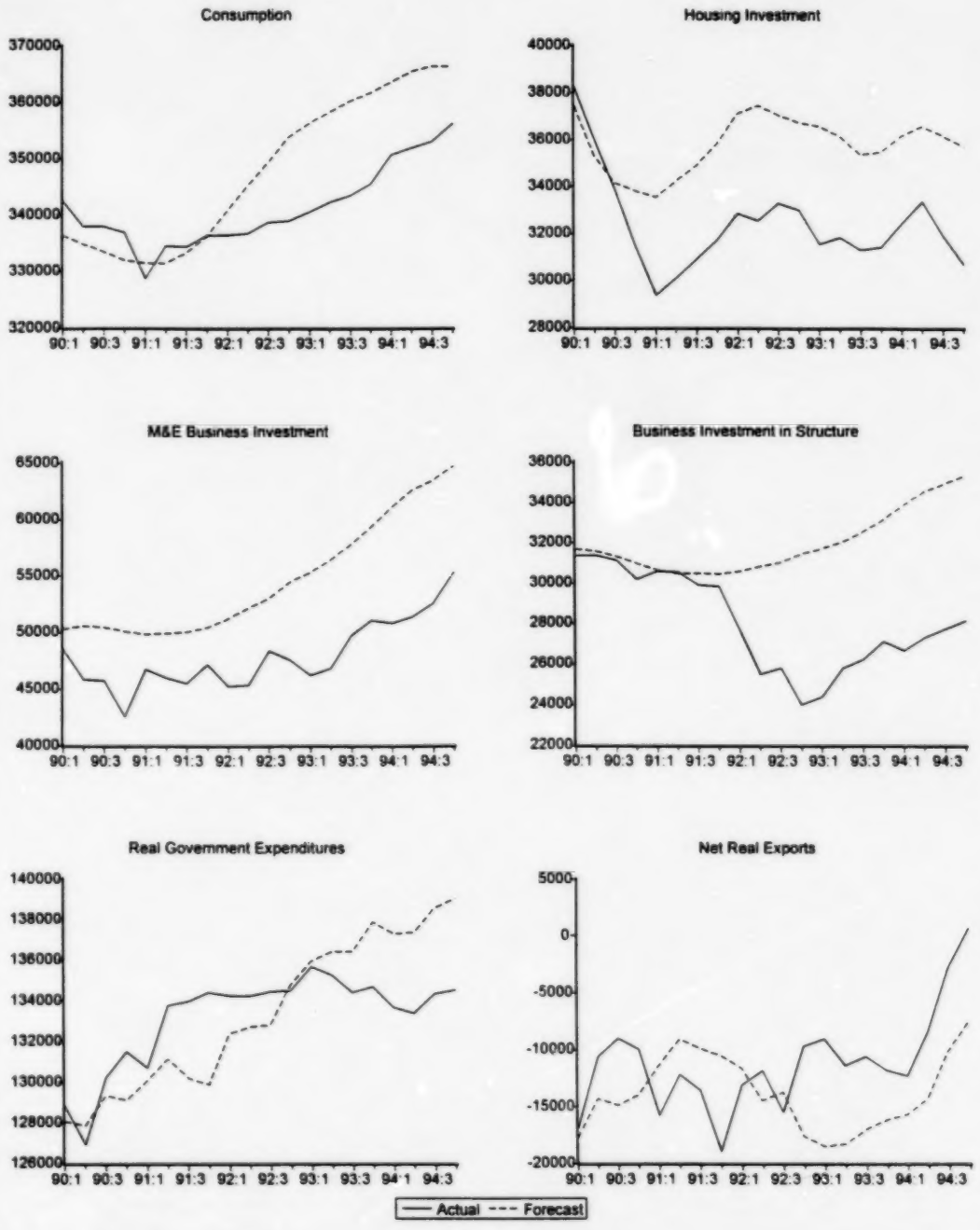


Chart 3 (Continued.....)
Long-Term Forecast: Detailed Results ($m)

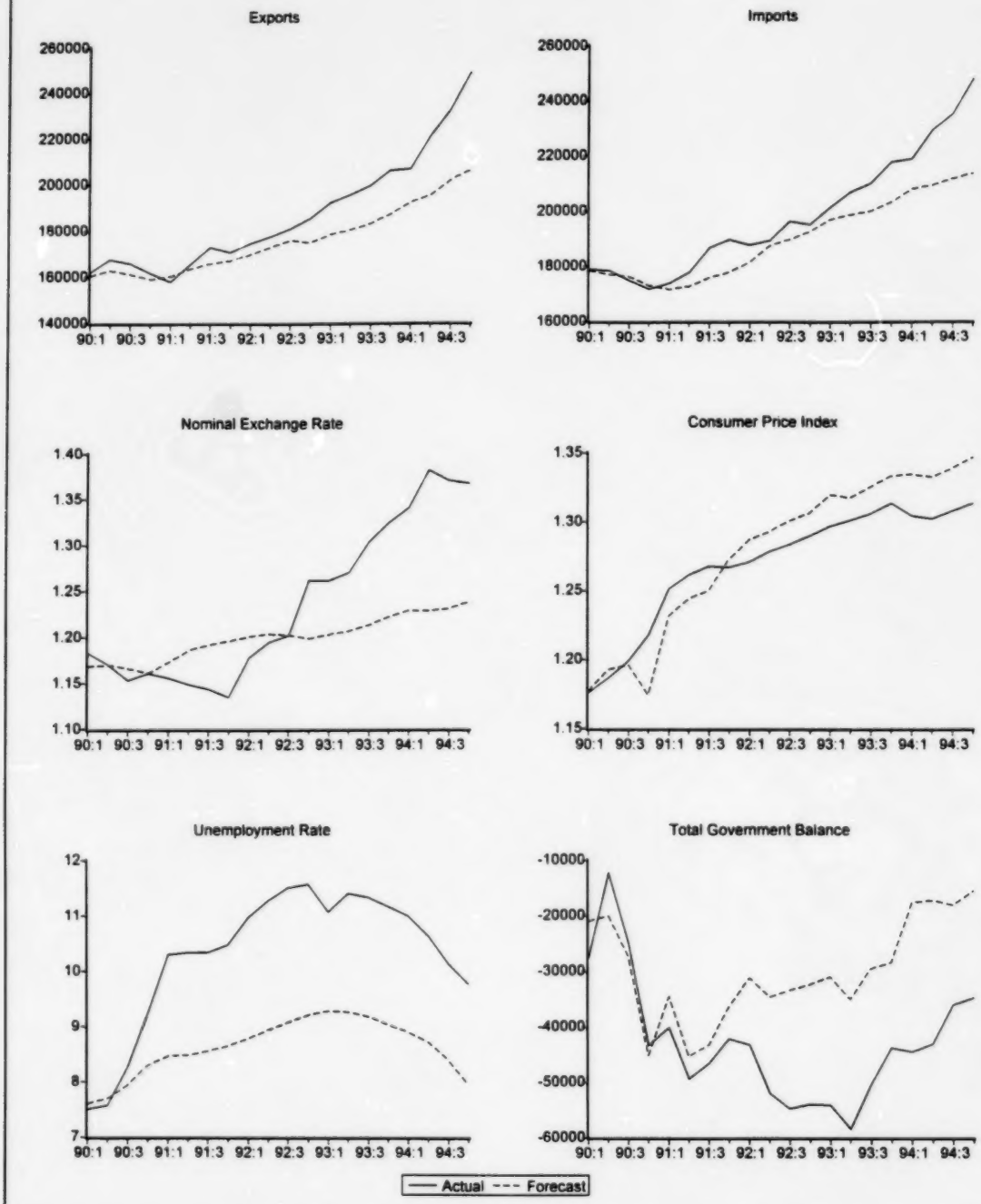
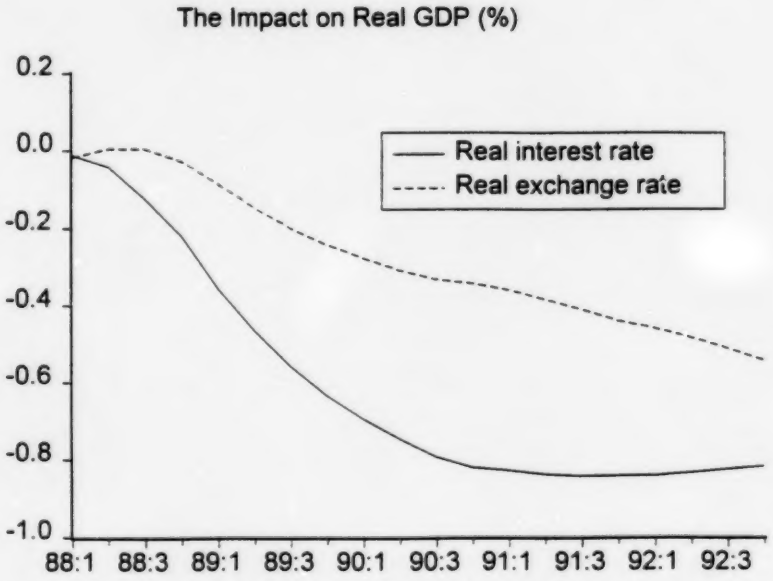


Chart 4
The Relative Impact Of The Real Short-Term Interest Rate And
The Real Exchange Rate On Real GDP: MCI Weights



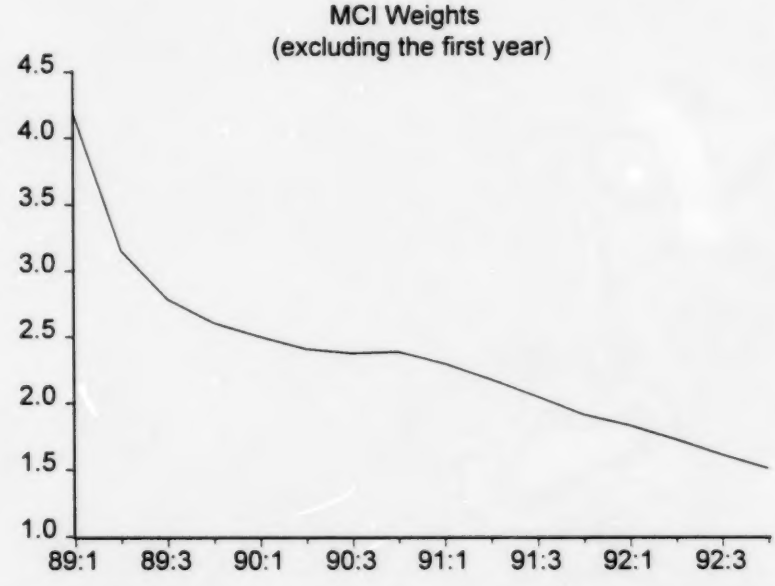
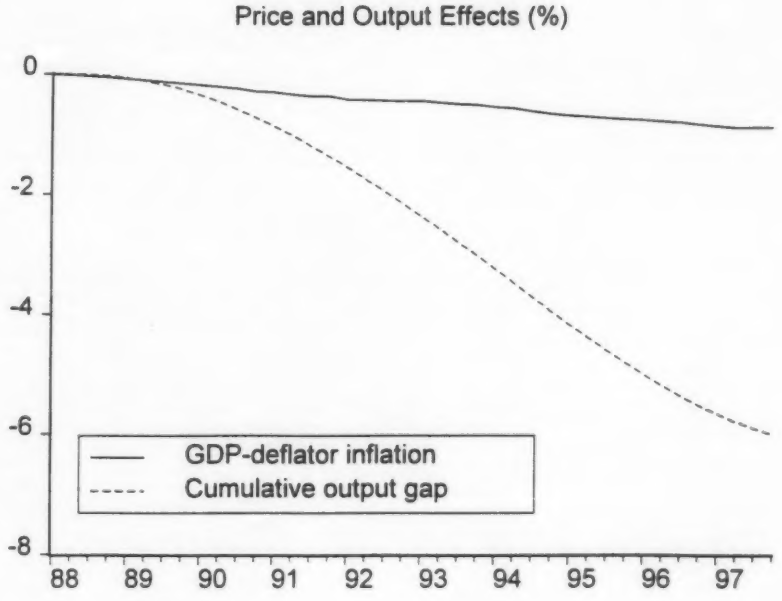
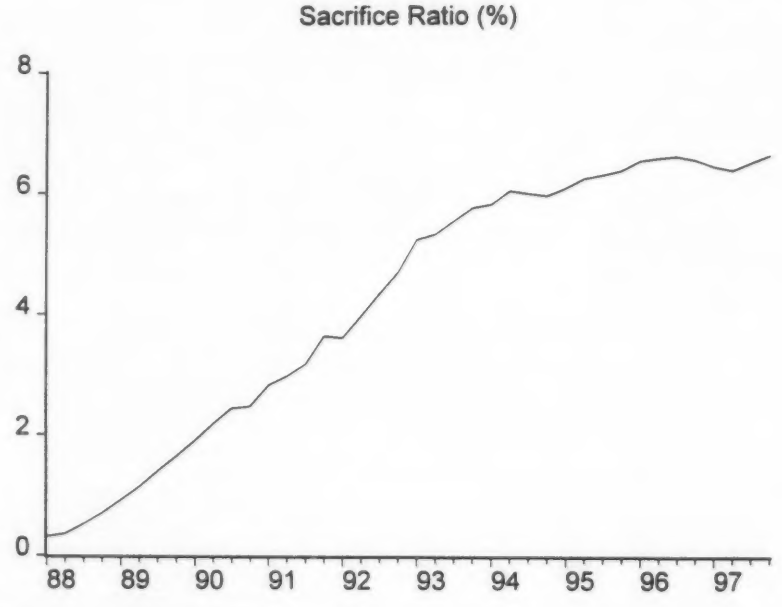


Chart 5
The Impact Of A 1 Per Cent Decline In The Growth Rate Of M1





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